JOURNAL
OF THE
WASHINGTON ACADEMY OF SCIENCES

VOL. 37 OCTOBER 15, 1947 No. 10

ETHNOLOGY.—*Wind River Shoshone literary forms: An introduction.*[1] D. B. SHIMKIN, Institute for Advanced Study, Princeton, N. J.

This paper sketches the main forms of unwritten literature among the Wind River Shoshone of Wyoming: the myth (in its two forms of heroic novelette and incidental story or personality sketch), the anecdote, the poetic song, the public prayer, minor invocations, and the jokes of daily life. These materials illustrate the inherent and distinctive artistry, the breadth of individual variability, and the depth of emotional expressiveness which may exist among a simple folk. My illustrations are limited by a paucity of materials and warped by incomplete knowledge of the language. They can but hint at the full richness and vitality of Shoshonean traditions, both at Wind River and elsewhere.

Other subsidiary goals exist within the framework of this essay. One is the typological delineation of the principal Shoshone literary forms in regard to structure, content, and style.[2] Another is the characterization of the relations between mythology and the rest of culture: the social setting and social functions of storytelling, the nature and variations of attitudes toward mythology, and the reflections of archaic and modern culture in the myth. A third is the indication of interactions between narrators and the tales they tell; how each narrator tends to pattern myth-stuff according to his mood, and how, in doing so, he reveals much of his basic personality.[3]

[1] Received May 5, 1947.

[2] Taylor has indicated the need for such types of study. (Cf. A. TAYLOR: *Some trends and problems in studies of the folk-tale*, Studies in Philology 37: 1–25. 1940; p. 18).

[3] Technically, this is the "projective" technique of modern clinical psychology. Helpful references in regard to this method are H. RORSCHACH: *Psychodiagnostik*, Bern, 1921 (1st ed.); H. PRINZHORN: *Bildnerei der Geisteskranken*, Berlin, 1923; H. A. MURRAY: *Explorations in personality*, Cambridge, 1938.

MYTH AND CULTURE

The relations between myth and culture among the Shoshone are varied and complex. Partly, they are functions of the setting in which the tales are told, and of the purposes—magical, pedagogical, and psychological—which impel narration. To some degree, they result from the infiltration of mythological concepts into the fields of philosophy and religion, and the ensuing interaction. Finally they reflect the impacts of constant cultural change upon habits of thought, impacts that have yielded quaint anachronisms and conscious archaisms among these people.

On cold winter nights, old people, usually men, tell tales for the edification of young and old. Although good storytellers are generally well known and in demand, no private rights to particular stories exist, nor is there any special etiquette involving audience and narrator[4] or calling for a round robin of tales.[5] The only requirement is that a tale, once started, must be told to completion. My informant, Tassitsie, told me:

> My father, Coyote's Tail, used to tell stories. In those days, two or three young fellows would come to his tipi in the evening, in winter, give him a smoke, and ask him to tell tales. This was not for amusement but for instruction.
>
> The myths relate happenings in the days when animals and birds were people. They did various things. In time, one of the animals became old, and started telling stories; he died, another started. It is in this manner that narrators have descended.

[4] As among the Crow. Polly Shoyo, who had visited that tribe, mentioned, however, that audiences were required to say "Yes" every so often to indicate that they were awake. Other informants denied this. (See R. H. LOWIE: *The Crow Indians*, New York, 1935.)

[5] G. W. JONES: *Fox texts*. Publ. Amer. Ethnol. Soc. 1: 3. 1907.

Tassitsie himself, for example, told no tales while his father was alive. On the other hand, all the old people, men and women alike, can tell stories. There is neither private ownership—he knows Pivo's (another informant's) repertory—nor any correct or traditional pattern of narration.

Magical control of weather is intimately connected with the narration of myths. One should not tell stories in the daytime, lest it storm. Summer-born people alone

FIG. 1.—Buckskin mask.

should tell tales. If winter-born people do, it gets very cold. Tales must be told to the formal ending, and not beyond, lest it storm. The ending itself is a statement obscurely hinting at melting snow, which results from properly told tales.

Even today a great part of the education of virtually all Shoshone children is through hearing mythology.[6] No matter that some scoff at tales as idle old men's chatter: storytelling is for many the only evening diversion. In consequence, the Shoshone have become immersed in the examples and precepts set forth by mythical characters. It takes but a tiny child to recognize the word "iʒhapiŋgën" (acting like Coyote), as an expression of deceit.

The purposes which once maintained mythology as a formal instrument of instruction have largely vanished. Few any longer take very seriously the etiological explanations occurring in myths. Nor do many retain painstaking descriptions of technological processes in their stories for reasons other than conservatism or feelings of artistry. Only one very old woman, Polly Shoyo, remembered the link between mythology and formal discipline. She related that masked men would imitate the Ghost Beings in order to scare bad and disobedient children.

I saw this when I was young. In winter, in the evenings, two men would walk into the tents, all over the camp. They never rode horses. They would wear masks of buckskin; or buffalo heads, with long beards. Their bodies were cloaked in a hide with the hair on it: that of a two-year buffalo, tail and all.

Around their feet were wrappings to make them large. They held nothing in their hands.

These men were called ʒo'aβič (Ghost-Being). They would just walk around, without singing, without talking, scaring kids—"they're going to eat the bad and disobedient ones." All watched them silently as they would walk around the camp.

Sometimes such persons would dress like old men. In fall and winter, they'd go around the camp somehow, with white hair and masks. They might be the same ones as the others: no one knows who they are. People fed the "old men" although not the ghost-maskers. Spectators did nothing, except laugh at them.

It may be mentioned in passing that such masked impersonators of cannibals are found widely throughout North America. A recent study by Verne Ray[7] traces the distribution of this cultural complex from the Iroquois through the Northern Plains to the Basin Shoshoneans. Further diffusion of these impersonators from the Basin to the Pueblo tribes of the Southwest may also be noted. For example, among the Tewa, "tsabije," an impersonator who goes about on certain occasions whipping the children of the village,[8] represents an unmistakable loan from Shoshonean *ʒo'aβič.

In contrast to the anecdote—on which, more later—the myth is not a recognized vehicle for wishful fantasy. True enough, mythology does relate some instances of exaggerated sexual prowess, as well as one tale of incest, that of the lecherous father.

[6] For a more extended discussion see D. B. SHIMKIN: *Childhood and development among the Wind River Shoshone.* Univ. California Anthrop. Rec. (in press).

[7] VERNE F. RAY: *The contrary behavior pattern in American Indian ceremonialism.* Southwestern Journ. Anthrop. **1**: 75–113. 1945; pp. 105–110.

[8] J. P. HARRINGTON: *Tewa relationship terms.* Amer. Anthrop. **14**: 472–498. 1912; p. 480. Cf. also E. C. PARSONS, *The Zuñi Adoshle and Suuke. Amer. Anthrop.* **18**: 338–347. 1916; p. 339.

It does idealize certain familial relations, such as that between brothers. And individuals, of course, do add particular twists and contribute special emphases to stories in consonance with their psychological needs. But Shoshone mythology is preeminently realistic. Cinderellas, male or female, do not occur in it. Its heroes are not models of human perfection; its villains often have redeeming qualities. The happy ending is not *de rigueur*.

Individuals vary greatly in the degree to which they believe myths relate real happenings of the far past or in the extent to which they integrate mythological characters into their daily religious lives. Some of my Shoshone informants, like Tom Wesaw, are skeptical of "just stories." But old people usually accept myths as true. Thus, Polly Shoyo constantly used brief tales to illustrate her general ethnographic discussions. Yet such acceptance of the historical truth of mythology has not precluded the simultaneous existence of contradictory ideas, and even of contradictory philosophies. Within mythology itself some of these contradictions occur. Several personages—Wolf, Coyote, Bat, Weasel—act as culture-heroes. Often several explanations exist for the origin of the same phenomenon. In one story Coyote originates death when he causes Wolf to die; in another he clubs his own children to death in bungling imitation of magician Beaver. But more important than such inner inconsistencies are the clashes with beliefs of nonmythological origin.

The central figure in the worship of all Wind River Shoshone cults—Ghost Dance, Sun Dance, Peyote Cult, etc.[9]—is damẽ'-ap:ẽ (Our Father), a vague, anthropomorphic, somewhat Christianized being whom all informants now identify with the white man's God. Whether the concept is completely a loan from Christianity or whether it actually contains aboriginal elements remains a moot point. Direct Wind River Shoshone contacts with white culture began in 1805, with active religious proselyting dating from 1834.[10] But it must also be recognized that Basin Shoshone and Comanche alike show the concept of a heavenly Father.[11] He appears only in a few tales, drawn in great part either directly, or through the Arapaho, from the Bible. A quotation from George Guina illustrates Our Father's position in the philosophy of several individuals:

> After death, an Indian goes to heaven. God makes him take a bath in a willow basket. The spirit now turns into a person and then goes to a camp, where he ghost-dances. While he dances, he feels good, and God says, "When they have a dance, they will be glad when they dance."

Unfortunately, the same informant told that Wolf, after reviving from death, departed, telling Coyote, "When people die, they're going to me." Is Wolf "Our Father" then? Most persons deny such a theory vehemently. But reconciliation of these fundamental conflicts is beyond their interests or abilities. One lonely individual has rejected all current religious ideas and built up his own system of belief in Coyote as Creator and God. Others, when confronted with ultimate metaphysical problems, merely say, "I don't know."

Beliefs concerning guardian spirits are virtually inchoate. A basic reason for such confusion seems to be the fact (which holds for western North America generally) that the primary religious experience is an auditory hallucination, commonly that of hearing a song. Visual imagery may be extremely undefined—"a sort of an eye," according to the experience of one of my informants—or even be completely lacking. Certain of the most powerful tutelaries, such as the Doyaratuwara plant and the ghosts of dead shamans, receive no mythological mention. But various animals, as well as monsters, occur both in vision and tale. Are such beings the mythological animals living on from the dim past or their ghosts? Are they

[9] For a full discussion of these cults see D. B. SHIMKIN: *Some interactions of culture, needs and personalities among the Wind River Shoshone.* Ph.D. thesis, University of California Library, 1939.

[10] See W. IRVING: *The adventures of Captain Bonneville,* New York, 1848; P. J. DE SMET: *Letters and sketches,* in R. G. Thwaites (ed.), *Early western travels 1748-1846,* 27: 129–411. 1906; p. 138.

[11] See W. P. CLARK: *The Indian sign language,* p. 121, Philadelphia, 1885; R. LINTON, *The Comanche Sun Dance,* Amer. Anthrop. 37: 420–428. 1935; L. SPIER, *The Prophet Dance of the Northwest and its derivatives,* General Series in Anthrop. No. 1. 1935.

individual beasts or representatives of their entire species? Evidence is absolutely contradictory. Thus, Water-Ghost-Being is sometimes a specific hairy monster.[12] At other times, people affirm the existence of an entire race of such beings, male and female, young and old. Water-Ghost-Being is commonly averred to have been killed when the Union Pacific Railroad came through. Yet, in recent years, John Trehero received from him supernatural power to cure epilepsy (which the monster himself causes).

Modern Shoshone life is a hodgepodge of early and recent elements of culture. The word "dish-vessel" (dï'so-na-ha''u) symbolizes such anachronisms well. It is formed from the English "dish," a genitive suffix, and an old Uto-Aztecan term for cup or vessel.[13]

The same admixture found in everyday life exists also in mythology. In general, the scene of the myths seems to be that of the Wind River-Teton intermountain zone. The cultural era is the protohistoric period, when horses are just coming in (about 1750).[14] But details reflecting very different historical periods may be found even in the same myth. For example, the story of the Split Boys describes an archaic type of club, whose use in actuality had been forgotten even by my oldest informants:

> Boy is asking it from his mother: "What wood is hard?" He is asking it. Old Woman said it: "Mountain mahogany," said it. Boy is running there. He has cut it down, and is returning. [It is quite short: the bark peels off.] He is putting a good edge on one side of it, is making its handle good. At night he is drying it.[15]

The same story tells, a little later, of such a modern act as getting dishes from White people for a feast.

> Now, in the morning, Boy is running toward them: toward that place where he goes to hunt, toward White men's houses. He arrived, then said to them: "We will have a big feast in your homes." "We will have nothing to eat," they told him. "No, when your table is set with dish-vessels, the food for which you will ask (will be) coming by means of winged creatures from afar."

THE MYTH: PLOTS

Wind River Shoshone myths deal with anthropomorphic animals or monsters, and with human beings. They group themselves into two main classes, heroic novelettes and incidental stories or personality sketches. Two subdivisions exist in the heroic tales, those with elaborated and those with simple plots. Thus, out of the 21 myths from major narrators which I recorded at Wind River, 12 are heroic novelettes, 4 are incidental tales, 3 are in novelette form but specialized in content (for example, Coyote, Grease, and Bobcat) and 2 are unclassified (Cottontail Shoots the Sun, the Theft of Pine-nuts).

The *elaborate heroic novelettes* are complicated and often very long (up to 10,000 words) with plots patterned upon one basic plan. This plan includes, consecutively, an introductory phrase, the statement of a cause for starting travel, and the preparation of equipment for the trip. Then follow the trip itself and adventures en route, adventures which develop steadily in difficulty and danger up to a thrilling climax. This development forms the core of the Shoshone myth. After the crisis has passed, reasons for a second cycle of adventure emerge. Often a new, more serious purpose induces a change in the character of the once-imperfect hero. Travel, adventure, and climactic struggle come once more, but are followed now by a final victory. An explanatory element, an anticlimax, and a fixed ending wind up the tale.

The introductory phrase is stereotyped: the hero or heroes live at a given place.

> They, the noxious insects, live there all together.[16]

The reason for travel soon arises, e.g., the wish to hunt for food, raid the enemy, or search for a new husband. Now the hero or heroes generally prepare special weapons

[12] One old woman identified plate 4 of the Rorschach Test as Water-Ghost-Being.

[13] Cf. Papago ha'u (gourd cup, jicara). J. DOLORES: *Papago nominal stems*, Univ. California Publ. Amer. Arch. and Ethnol. 20: 22–31. 1923; p. 28.

[14] D. B. SHIMKIN: *Shoshone-Comanche origins and migrations*, Proc. 6th Pacific Sci. Congr. 4: 17–25. 1939.

[15] (By Pivo Brown.) This is a careful translation of a text. The principal liberty taken has been to rearrange the order of subjects and objects in accordance with English usage.

[16] From Tassitsie's "Mosquito Kills Cannibal."

or magical devices. For example, Weasel's elder brother makes bows for the pair of them.

At this time, at night, Elder Brother did it, the front of this he did. Well he did it. He keeps on scraping it off all over. Having finished scraping it off all over, now he notched it. Having finished drying it, now he strings that bowstring.[17]

Travel begins, but in a leisurely fashion.

The two now, in the morning, went: in the day, kept going along. That night they arrived. In the morning, having arisen by daylight, at this time, they went—[18]

Soon, the heroes meet adventure. Successively, they must combat greater and greater but always similar difficulties. These result either from faults (mischievousness or lechery) in their characters or more rarely, from deliberate choice.

Owl's widow is so contrary as to insist on visiting Skunk's home, and on looking over the hill at the source of strange noises. As a result of both indiscretions she and her little son are killed and have to be revived each time by magician Badger, at the price of sexual intercourse. In another myth Bluejay's trickiness leads to reprisals and war.

Finally the crisis comes. In one tale, the magical elk liberated by Coyote turn into hostile Indians, and make war upon him and Wolf. In another, the Weasel brothers at last reach their destination at the "Water-Buffalo's" lair. Now ensues tense action that keeps ever increasing in emotional stress up to the dramatic climax. For example, Weasel's elder brother is preparing to capture the Water-Buffalo from beneath the surface of the lake. He tells his brother not to fear or run away, no matter what may happen.

At this time, the elder brother is coiling that rope, at this time now comes into the water. Then the younger brother has just looked at that elder brother of his. At this time, the elder brother is a walker-away in water. At this time, the elder brother, he who is up to his knees, comes into the water. At this time, the younger brother, as he keeps looking at him, now once to that elder brother said it: "My Elder Brother, enough! My Elder Brother's knee level already appears on the water!"

Then, he, the younger brother, again to that elder brother of his once said it: "My Elder Brother, enough! His waist already appears—"

Then he, the younger brother, yet again is looking toward him. Then he, the younger brother, even then to that elder brother once said it: "My Elder Brother, enough! Your neck barely sits on the water!"

Then he, the younger brother, once: "My elder brother's head appears but a little bit!"

At this time he, the younger brother, to that elder brother, once said it: "My elder brother appears no more!"

Then he, the younger brother, looked toward it, that elder brother's disappearance. Then that which is that younger brother's elder brother's disappearance place—(lo!)—beyond it is a waterspout! Then he, the younger brother, he Weasel, once: "Something indeed has eaten my elder brother."

Then he, Younger Brother Weasel, shot with his own arrows. At this time, he, the younger brother, consumed all his arrows shooting. Then he, Younger Brother Weasel, at this time is a weeper: "What could it possibly be that will, may be, keep on swallowing my elder brother?"

He now, Weasel, at this time is a weeper.[19]

As strife ends, the new situation crystallizes. Coyote's evil thoughts have led to the death of his beloved elder brother, Wolf. Coyote must recover his hide from the enemy to restore him to life. The Split-Boys, resurrected from one youth cut in half by his maternal grandmother, propose to rescue their captive mother from a cannibal giant. Often the personalities of the characters change completely as well. Coyote, once childishly jealous of his brother, frantically attempts to right his own wrong doing. Weasel, finally chastened by the grievous effects of his mischief, becomes an obedient boy, and a benefactor. Young Mourning Dove, having found his mother, is turned by her into a small child again, to facilitate their flight from Water Ghost Woman.

The second adventure parallels the first, but on a grander scale. Again there is travel, with gradual, repetitive development of incidents and events. In certain stories such repetition achieves a truly poetic balance of beauty and style. Notable indeed is an account of the Old Woman who has helped Weasel to escape from Monster Owl's island on a boat. She watches the fire which he builds in it every night as he floats away into the distance.

[17] From Pivo's "Weasel's Adventures."
[18] *Ibid.*
[19] *Ibid.*

Then she, Old Woman, is looking for it; in the night is looking for it, his red fire-making:
At this time, sees it. Then she, Old Woman, does not look for it in the day.
Then it is dusk. Now Old Woman again is looking for it, his red fire-making. Far away a tiny, red fire burns.
"Far away indeed it has become," she, Old Woman thinks.
Now again she sees it; then, in the day, does not look for it.
It is now twilight, and then evening.
It now, a twice as tiny, red fire burns. She, Old Woman, is looking for it.
She then, Old Woman, once thinks,
"It probably right now far distant has become," she, Old Woman, thinks.
Then in the day, she does not look for it.
Then it is again twilight, again evening.
She now, Old Woman, once is a looker for that wood fire.
Once?—thenceforth impossible to see it.
Then it once, may be, a red-firing barely has again become.
Red fire burns invisibly.
She now, Old Woman once,
"Right now, indeed far away, it has become," she, Old Woman, thinks. . . .[20]

The heroes meet obstacles once again. Not infrequently now such difficulties are enough to require aid from magically powerful patrons. Fleeing, Mourning Dove and her baby son find shelter in Uncle Vulture's nose, and cross a river on Uncle Crane's leg. Uncle Bat finally disposes of the pursuing Water Ghost Woman. Again, four adopted paternal grandfathers tow Weasel's boat to land, rescue the youngster from malicious dwarfs, and finally advise him how to return safely to his brother. In still another case, a friendly rattlesnake kills Cannibal's sentry to help Coyote and the Split-Boys win their cause.

At last the heroes come to their final and greatest resistance. Now begins the final, cyclopean struggle. Illustrative is Coyote's and the Split-Boy's encounter with Cannibal after the boys' mother, the monster's captive, has succeeded in throwing his bow in the fire.

Then he, Cannibal, stands there purposefully. His bow is no more. Then he Cannibal, "Double-Vulva, where is my bow standing?" said it.

She, their mother, "In the fire!" said it.

He, Cannibal, at that fireplace is looking purposefully. That little piece of his bow lying in the fire, that he takes purposefully. Toward it he keeps spitting, stretching it out. Then Cannibal, having stretched it just like that, just like a bow he tries to stretch it. Then, with his arrow, he aims.

They, the two boys, broke that bowstring a moment before he shot.

Then he again keeps spitting on it, making good that which they had kept on almost breaking.

Coyote said to them, "I myself, I will take a shot at you. You, for my arrow, would you stoop?" Cannibal stoops. It, the anus, is a big hole; there he shoots.

Cannibal, "In no way can anything be done. Let's all of us wrestle!" said it.

He, Cannibal, drags them; knives against him did nothing at all. He, one of them, "Let's make a fire," said to them. It, the fire, blazes. That Cannibal's flesh, cut off, they were throwing on the fire. It kept jumping back on the very same way, would stick back on. Then they, from whose work he felt tired, they opened his breast—his heart beats—then cut out his heart on the fire.

Back it would return from the fire, back they would throw it. It, the heart, gradually goes slower. Cannibal gradually goes slower. Then it, the heart, cooked because of it. He, Cannibal, then did not move.[21]

After the successful termination of the struggle, an explanatory element often enters. Water Ghost Woman's broken remains are the obsidian flakes that people use nowadays. Coyote's daughters, who were pulled into the sky by an arrow shot by their brother after they had committed incest with their father, become the Pleiades. Not infrequently, anticlimax follows and serves to throw a final gleam of light upon the participants. For example, when Coyote and Bobcat have ended their feud and transformed each other into their present-day selves, Coyote espies his younger brother once more. He is eating luscious wild carrots which he pulls out of the stream with his tail. Coyote, envious, pleads with him, then cajoles him into revealing his secret. However, Coyote's greediness soon leads him to grief, for his tail catches just when he tries to bring up too many wild carrots. Bobcat, from a distance, hears his piteous appeals and finally releases him magically. A mishap likewise befalls Weasel, despite his own adroitness in trickery, his heroism in fighting monsters. Coyote's bluster frightens him into relinquishing the wondrous prize of his adventures, Monster Owl's down-feather, which, donned on one's head, looks like "a mist floating."

[20] *Ibid.*

[21] From Pivo's "The Split-Boys."

And thus he comes home empty-handed.

The ending of all mythological tales is a prescribed magical formula, iʒap:e tī na (*or* a:'βi) pa:'sagai da'ʒakwagĭn. The meaning of this is somewhat obscure, most likely, "Coyote way out there is tracking through slush."

The *simple form of heroic tale* includes but a single cycle of adventure. For example, a young man comes to Coyote's camp, declaring that the noxious insects have killed his people and are threatening the very existence of mankind. Coyote cooks up a scheme to combat this menace and gets the birds to help him. Then he and his followers meet the pests and destroy them, except for a few who escape in the smoke to form mosquitoes, flies, etc. The entire account is bare in comparison with the richly embroidered novelette; intentional repetitiveness for artistic effect is far less frequent. Yet the structure is almost identical: introduction, preparation of weapons, travel, fight, victory, and, often, explanatory element and anticlimax follow each other in regular succession.

In contrast to both types of heroic tale, the *incidental story* or personality sketch emphasizes the character of the central figure, usually Coyote, rather than any exciting event. The form is not rigid (except, of course, for the prescribed ending); the plot is humorous. For instance, Coyote races Dragging Hair's people. As stakes he puts up sticks, which are miraculously transformed into horses. As long as he keeps on winning, he can continue his subterfuge and afford to eat the real horses that he wins. Finally, Frog and his brothers beat him through a trick of organizing a relay of identical runners against him. Coyote must now yield his magic horses, which soon resume their wooden forms. But he learns the reason for his defeat from his anus adviser, and is soon eager to race once more. Dragging Hair's people, however, refuse to have more to do with the cheat. At times the incidental story grows in length. Thus, the tale of the Bungling Host consists of a number of incidents. But they are coordinate, show little unity, and there is no attempt to create a climax with a single artistic effect. The one unifying thread is the consistent representation of the principal character as trickster, dupe, lecher, or any combination of the three.

THE MYTH: CHARACTERS

Characterization comprises one of the most intricate aspects of Wind River Shoshone mythology. Such high development of this phase of story telling contrasts markedly with the rudimentary type of characterization found in the tales of many American Indian peoples. The automatons moving monotonously through the rigid pattern of Tsimshian tales,[22] the incredible Crow heroes[23] saved only by the tiniest of fears from impossible perfection, the weak, colorless individuals overwhelmed by the grandness of Zuñi cosmology[24]—none of these have a place in Wind River Shoshone tales. Instead, the people pictured are a complex human mixture of good and bad: rakes and saviors, cowards and heroes.[25]

The stories deal with three types of characters: anthropomorphic animals—Coyote, Bat, the Weasel Brothers, and Bobcat; monsters—Water Ghost Woman, Buttocks-Bouncer, and Cannibal; and various human beings, some named (e.g., Dragging-Hair) and others anonymous (e.g., the old woman who helps Weasel escape from Monster Owl's island). The animal characters, especially Coyote, are the most prominent. Their adventures, their jokes, their quarrels form the essential themes of Shoshone mythology. The monsters provide a constant foil of stupid villainy. The human beings are but minor actors, whose deeds may serve as prologues to the grand artistry of Coyote and his kind or, at times, fill a brief tale.

The Shoshone narrator employs distinct artistic techniques for depicting each of the three types of actors. The same animals appear time and again in various tales. The exigencies of plot necessarily demand

[22] F. BOAS: *Tsimshian mythology*. Bur. Amer. Ethnol. Ann. Rep. 31. 1910.

[23] LOWIE, *op. cit.* p. 151.

[24] R. BUNZEL: *Zuñi origin myths*. Bur. Amer. Ethnol. Ann. Rep. 47: 545–609. 1930.

[25] These qualities also exist in Coeur d'Alene mythological character; cf. G. REICHARD, *The style of Coeur d'Alene mythology*. 24th Internat. Congr. Americanists, 243–253. 1930.

many varying qualities and circumstances in their existence. Yet a definite core of behavior remains in every instance to mark the distinctive peculiarities of each animal actor. In contrast to the variations of animals' roles, the monsters fill the same role in every plot. Skillful variation of their personalities, however, serves to differentiate one ogre from the next. Human beings of all sorts enter the scene from time to time. Their characters and actions are not predetermined in the same way as those of the animals or monsters. Consequently, the narrator describes their emotions and their deeds quite fully in order to bring their characters into bold relief.

An examination of Coyote's personality illustrates the Shoshone treatment of animal characters excellently. On first impression he seems to change completely from tale to tale. In some myths he is the chief of the animals. In others he is the chief's younger brother dependent on him for help. In still others he lives alone, a person without prestige. His magical and personal powers are likewise quite variable. At times he is cunning and endowed with supernatural power; at others, a hopeless dupe, a weakling. His occasional bravery alternates with abject cowardice. His occasional solicitude for his kin alternates with vilely incestuous lust and childish jealousy. But further viewing of this maze of inconsistencies reveals coherence in Coyote's temperament nevertheless. Whether he is chief or outcast, it matters not, he is always ready with suggestions and orders, good or bad, heeded or unheeded. Whether he has exceptional powers or lacks them, Coyote must try to excel the rest at any cost whatever. Coyote's bravery is greatest when danger wanes; indignant refusals to perform anything more than puny deeds may incidentally save his hide. Prudence is a gentle term for his recurrent cowardice. Coyote's fondness for a younger brother does not preclude rough grumbling over a woman's ridiculous preference for that fellow instead of him. Coyote's lust is sadly transient. At one time, a moment of confusion led him to the tragic error of eating his penis, which he had left for safety's sake under his bedding. On looking further, we see the qualities which are the very essence of Coyoticism, if I may coin a portmanteau word of Coyote and witticism. Coyote is loathsome; filth and perversion are his delights. Coyote is merciless; boundless rage, ruthless murder, cynical cannibalism are his tools. Coyote is extravagant; the most senseless imitation, the most stupid negativism, and the most voracious greed and lust are his principles. Nevertheless, Coyote is a philosopher whose spirit is unbroken in the worst of adversity; heroic and idiotic, and yet superb.

To exemplify the various aspects of Coyote's character with any fullness would be to recapitulate Wind River Shoshone mythology. Therefore, a few bare references must serve our purpose. When Coyote's wife hears of the perversions the mysterious suitor practices upon her daughters, she knows he can be none other than Coyote. At another time Coyote promises to restore to good health the dancer who has been shot by some unknown person, but instead he eats him. Again, disobeying Wolf's sound advice, Coyote deliberately mistreats Rock, who chases the rascal nearly to death. In another tale, Coyote tries desperately to jump up to his daughters in the sky. His failure daunts him not at all; his sorrows fade in the hunt for something to eat.

The characterizations of other animals follow the same pattern of adjustment to specific plots and maintenance of constant traits as in the case of Coyote, but in a simpler fashion. For instance, sexual prowess is Bat's principal quality. In one story he is a very disagreeable young man. He amuses himself on a hunting trip by brutally raping an inoffensive young girl. On another occasion, he puts his ability to better use. The size of his penis fascinates a Water Ghost Woman who has been relentlessly pursuing Bat's sister and her little son (the monster's erstwhile husband). She demands coitus, but —alas!—Bat's vigor kills her. Bat's powers now result in the rescue of mother and son, and the bequeathing to mankind of the obsidian flakes into which Water Ghost Woman's body breaks.

Shoshone monsters are physically powerful, magically endowed, and invariably hostile to man and human animals. They

are fast runners and vicious fighters. True enough, they are stupid and easily distracted from their designs, but their innate suspiciousness and the magical talents which they or their assistants possess make them ever dangerous. Their chief concerns are food—preferably human flesh—and sexual intercourse; but, rarely, they may indulge in playing and wrestling among themselves. Yet even they have merits. Their habits are orderly, and their manners toward their intended victims are usually most polite.

Differences of personality exist even among monsters. One Water Ghost Woman is brutal, nay, sadistic. Sardonically, she calls her baby victim "my dear little daughter's child," before she tortures him by burning. Then she tears off his head. Later, she murders a woman by beating on her breasts with a green switch until death quiets the agony of her prey. Another Water Ghost Woman is a much gentler soul. When she gets her chance to steal a baby boy, Mourning Dove's son, she does not kill him savagely. On the contrary, she takes him home to raise as a husband, a procedure which, true enough, takes but little time. She merely stretches his penis to proper size—and presto!—he's a young man.

Soon this young man must hunt food for his monster wife. While hunting, he meets his uncle Eagle, who tells him the facts about his abduction and his mother's unceasing longing for his return. Eagle also gives the youth instructions and magical implements to help his escape from Water Ghost Woman. Following this advice, young Mourning Dove eludes his jealous mate's close surveillance and flees to his mother. Soon, Water Ghost Woman is in hot pursuit. At first she wishes to punish only the mother:

"Darned old Mourning Dove is stealing my husband away from me. I'll club the female!" says she, Water Ghost Woman.[26]

She suffers many mishaps in her chase, and endures many hardships. Only the defecation of her trusty anus, which at other times merrily keeps breaking wind as she runs, "X^{w}! X^{w}! X^{w}!," can overcome the magic barriers which she encounters. Her temper grows ever worse. Slowly, she realizes that she is being scorned: old passions inflame her rage. Slowly she realizes she is being tricked: new injuries increase her fury. As a consequence, the next time she sees Mourning Dove and her son, she shakes her club and yells at them from a distance.

"I'll really do right by you! We were the best of married couples—! You two probably believe yourselves about to be safe, while actually, I myself, will keep on hitting you thus!" she, Water Ghost Woman said.

After a long and eventful flight, Mourning Dove and her son take refuge with Bat, her brother. The latter lays a trap for the pursuing ogre. When Water Ghost Woman has tracked the couple to Bat's house and is interrogating him concerning their whereabouts, he pretends ignorance. As he talks, he calmly proceeds to pound his penis with a hot rock. The sight of such unbelievable potency banishes all thoughts of her old lover from Water Ghost Woman. A new, burning passion arises within her. "Maybe you will copulate with me?" she, Water Ghost Woman, said it. But Bat refuses. He copulates with no one; a hole in a hot rock nearby serves as his wife. Now Water Ghost Woman becomes frantically eager indeed, "Yes, all right, copulate with me just a wee bit!" The tragic results we already know: pleasure, utmost satisfaction, pain, death, destruction. This is the reason that obsidian flakes rather than amorous female monsters are now found in the mountains.

The characterization of human beings proceeds in two typical ways: the development and illustration of personal traits by the unfolding of a plot, and vignettes of human emotion. The story of a man's feud with a Water Ghost Woman illuminates the first method:

A man, his wife, and their child camp out by themselves in a country infested with monsters. They have little to eat, so that, when night falls, their child keeps crying from hunger. The parents try to still it, but fail. Then they abandon the infant in the center of the tent, and bide in a far corner. Soon a cannibal comes, tortures the child, murders it, and then carries it off.

This atrocious act spurs the child's father to action. The next day he goes scouting for the monster's lair. But fear conquers his desire for

[26] From Tassitsie's "Mourning Dove Rescues her Child."

revenge, and he returns without achieving his purpose. When he comes home, he finds that his wife, too, has been Water Ghost Woman's victim.

The second tragedy surpasses human forbearance. The erstwhile coward now braves all dangers in his frenzied grief, and finally succeeds in avenging himself on the cannibal.[27]

A vivid description of human reactions occurs when Split-Boy directs his paternal grandmother to kill him (so that, unknown to her, he may be resurrected as a pair of twins). She protests violently but finally does the deed.

Then (he) said it to that Old Woman: "That with which you will club me is this. You, then, right after having clubbed me, will cover me well." He said that; now he hands it over. "Old Woman, all right, hit me!" said it.

Old Woman holds it up. "To kill him with whom I stay, my grandson,—" having thought (this), (she) refrained. "I might kill him with whom I have my home," she thought, still refraining.

Her grandson thinks: "She didn't hit me in any way at all—"

Then his grandmother hit him, killed him. Then Old Woman covers him, that boy, well. Old Woman faints in horror. Old Woman in the night awakes crying, falls asleep in horror.[28]

But when the old grandmother, early in the morning, sees that two live Split-Boys have formed out of her dead grandchild, she becomes deliriously happy. They ask her to tell Coyote of their plan to rescue their mother, but not to tell him they are now two. And so she goes on her way.

Old Woman goes along "da—da—da—," "gan—dan—da—"—(humming and singing in her joy).

Coyote hears her and suspects something. When she speaks to him she stutters, and her tongue slips into a tell-tale plural rather than the dual.

"My . . . my son's child is saying it: Tell Coyote, let's, all of . . . —us two, try to go after my father's killer right away."

THE MYTH: LITERARY DEVICES

Artifices of sound and of meaning are employed by narrators to enhance the beauty and dramatic vividness of their tales. They flow from six main sources: play on sounds, play on sequential devices, variations of expression, visual imagery, appeals to emotions, and special devices of mythical significance.

The *play on sounds* involves two phases of artistic endeavor, the patterning of the normal speech-sounds and the use of special sound effects to add particular vividness. The patterning of speech-sounds is intimately connected with the phonetic peculiarities of the Shoshone language. The consonants are simple: spluttering velar, lateral or glottalized sounds do not occur. Furthermore, consonants can not combine into clusters. Tonguetwisters of the typical Crow sort are therefore absent.[29] The constant alternation of consonants and vowels, the phonemic differentiation of two vocalic lengths, and the regular patterning of three distinct degrees of stress infuse Shoshone with a distinct rhythmical swing.

In general, the initial vowel of each verbal stem in a word is stressed, with secondary stresses on succeeding odd vowels. This, of course, follows the old Uto-Aztecan pattern,[30] which is noticeable in its most rigid form in Southern Paiute.[31] In Shoshone, many true and apparent exceptions are to be found to this rule, so that regularity does not crystallize into monotony. For example:

surō mba'hanï wï' uʒa'wašaru'in' gō'tank"//
pōnurōʒa'wašaru'in' sur wupi'x"//
(They, the father's sisters now are swinging him hard; he whom they are swinging leaps off.)[32]

Speakers of the language clearly appreciate its melody, for the rules of good elocution, in myth-telling and oratory alike, demand a smooth, continuous flow of words elided into one another.[33] They demand a flow that pulsates in waves of ever-rising pitch, and is broken by the metronome of stress. They permit no stoppages or changes in that flow, or, in fact,

[27] From Tassitsie's "The Feud with the Cannibal."

[28] From Pivo's "The Split-Boys."

[29] Cf. Lowie, *op. cit.*

[30] B. L. Whorf: Amer. Anthrop. 37: 600–608. 1935.

[31] E. Sapir: *Southern Paiute, A Shoshonean language.* Proc. Amer. Acad. Arts and Sci. 65: 1–296. 1930; p. 39 ff.

[32] From Pivo's "Weasel's Adventures." The orthography follows strict Americanist usage.

[33] In normal Shoshone speech final consonants followed by initial vowels in the succeeding word are treated like intervocalic consonants, being subjected to various elisions.

phonetic contrasts of any sort, as media of artistic expression.

The small number of initial consonantal phonemes and the paucity of basic stems result in constant alliteration in Shoshone. Quite typical is the following phrase:

su"ni sur yĭ'gwĭnĭd yi:k dĕ'a kwĭd//surewĭ" ukwĭdak sit ɔ'gupɔa'nakʷ//su'khwent surĕdĕ'a urĕna'yanuk urĕna'yanu'kiar.

(When it has become evening, again she defecates. As she was defecating, it was the earth that mended. From there, she again is tracking them, is their tracker.)[34]

On the other hand, various phonetic rules in regard to the sonancy, spirantization, and other alterations of intervocalic consonants save the tongue from monotonous cacophony. This is an especially dangerous potentiality in Shoshone, which uses reduplication as a normal grammatical mechanism. Thus it is that theoretical "mi'mian" and "do'do'in" become "mi'ɰian" (they went) and "do'ro'in" (they are climbing).

The combination of rhythmical and alliterative qualities in the language makes the narrator's emphasis upon rhyme wholly natural. Most descriptions, even by one so artless as Charley Nipwater, are in rhymed prose.[35] An illustration will make the point clear.

pa:'rhi du:'parhi mu'ɣambia so'guria ɣukʷ hu'-kaβagia na'yĭgwĭt

(Elk, moose, mountain sheep, mule deer, Virginia deer, in the willows may they be!)[36]

The special sound effects are either formal jugglings of words or imitations of natural noises. In the former category are such nonsense words as "e:'βimɔ'mɔgusɔ," Coyote's magic name (an English approximation of this might be clay-nose-ose), as well as puns and similar plays on words. Puns, however, are typical of every-day joking but not of myths. An instance of mythological punning occurs, nevertheless, on the occasion of Blind Coyote's finding that his two female companions were named Waving Person and Sage-Brush Girl. "Strange," he said, "some people call me Waving Pretty-Boy, and others Sage-Brush Pretty-Boy. So we should be together, for our names are the same."[37]

The imitations of natural noises are an integral part of the Shoshone language but to a small degree. Outside of interjections, onomatopoeia has originated only a few verbs, e.g. wɔ'wɔ-, to bark, and nouns, e.g., šu'akwakwa, robin. Most other onomatopoeic words, e.g., hi:'to, meadowlark, are really remnants of a Plateau Shoshonean past.[38] On the other hand, unformalized imitations abound. An example of stuttering has been noted on a previous page. Baby talk also occurs to give coy effects.

ik ba:'bawuci dĕ'as uyu'yuhuci ŏm ba'bawiči be:'kapuci

(Here's an 'ittle bit of water and some itsy-bitsy fat from your buddy's 'ittle kill.)[39]

The Shoshone teller of tales does not even disclaim to imitate plain noises. He mimics the sounds of beasts, monsters, and particularly birds: Mourning Dove as she sorrows for her lost son, and pipsqueak Meadow-Lark[40] as he gives aid to the enemy. He strains the capabilities of the human voice to give the sound of a knife as it slits a throat or of an anus as it breaks wind.

The ordinary *sequential devices* of Shoshone myths are four in number: parallel development to a climax, simple reiteration or repetition, sharp contrast, and parenthetical incorporation. As has been shown before, parallel development is the principal characteristic of plots, although reiteration is used in at least two ways. Characters relate adventures *in extenso* to others, either before or after their occurrence. Also, the plots of the longer incidental stories are largely repetitive. The anticlimaxes so common in tales exemplify contrast. Since virtually all details contribute directly to the development of the total plot the parenthetical incorporation of incidents is less usual than the other devices. Exceptions in a certain sense are the unessential elabora-

[34] From Tassitsie's "Mourning Dove Rescues her Child."

[35] As in the constant rhymed prose (es-Saj') of descriptions in classical Arabic belles-lettres.

[36] From Charley Nipwater's "Coyote Liberates the Animals."

[37] From George Guina's "Blind Coyote."

[38] Cf. E. SAPIR: *Southern Paiute dictionary* Proc. Amer. Acad. Arts and Sci. 65: 537–730. 1931; p. 557.

[39] From Pivo's "Weasel's Adventures."

[40] Exact ornithological identifications are not available.

tions of the emotions of minor human actors and the somewhat similar lavish descriptions of tools.

The structures of incidents within plots abundantly illustrate all four types of sequential devices. Parallel development is ubiquitous; the main form in which it occurs is the description of a series of actions in time. The Shoshone language makes such temporal seriation particularly tempting by offering the narrator his choice of many slightly differing suffixes of tense and aspect. Consequently, constancy in the stems used and variation in the suffixes easily and concisely create parallelisms. A textual example illustrates the superiority of Shoshone to English in this respect: Weasel's adoptive grandfathers start, in turn, to tow his boat.

suβe sur pa:'nɜux ba:'gar wĭtĭ'gwax sum tu:'nkunt gë'karix//*uge'yagunaik*^{w} (1) suβe sur sa:k *gunai'k*^{w} (2)// suβe *uge'yagunai'gant* (3)//suβe sur *ba:'rukaigunaigĭn* (4) sur sa:k *ba:''aβaigunaigĭn* (5)//sur pa:'nɜux suβe *gwa'yax* (6) suβe sur *gwa'yaβit* (7)//bitus su'βa sa:'kiwa ma'rtoro'ĭn[1]

(Then he, Mink, hits the water with rope in mouth. He *sped chasing it* (1); then it, the boat, *sped* (2). Then he *is in the state of speeding in chase of it* (3). Then he *is speeding under water* (4); then it, the boat, *is speeding on the water* (5). Then he, Mink, *tires* (6); then he *is one who is made tired* (7). Again, he is hoisting himself up on the boat.)[41]

Parallelism in logical or causal sequences occurs with less frequency. Typical, however, is the following instance:

It is he, Coyote, who is not eating; through not eating he starves.[42]

Repetition is also a very important artifice. It forms, of course, an essential part of the parallelisms and is also relished for its own sake. Most activities and phrases must be repeated four or five or ten times, according to individual taste. Repetition in the form of enumeration is popular. Thus, a frightened man has run to tell Coyote:

"They now—they who are mosquito-fly, big-fly, gray-fly, black-fly, yellow-fly, all dangerous—are arriving at my people's home."[43]

[41] From Pivo's "Weasel's Adventures." Shoshone and English parallelisms are underscored and similarly numbered.

[42] From Tassitsie's "Coyote, Grease and Bobcat."

[43] From Tassitsie's "War with the Mosquitoes."

Furthermore, the narrator often stresses important facts before and after their results. This happens when Water Ghost Woman has bullied Uncle Vulture into revealing the whereabouts of Mourning Dove and her son.

He now, having felt fear of her, is relating it: "Already I, myself, in this way, blowing my nose, have snorted them far away." This is that which he is relating, having felt fear of her."[44]

Contrast forms a part of several descriptions of actions. Coyote, for instance, runs up the mountains chasing mountain sheep, then down again; then up again, and so on until he is exhausted. Only one type of contrast, however, seems to be an integral part of Shoshone style: antithetical orders, with the negative preceding the positive injunction. Weasel's Elder Brother furnishes an illustration as he directs the youngster, preparing for their trip.

"You, having gone—that obsidian over there is worthless; two buttes beyond it, there now it's all good—from there you will now fetch much, all you can carry."[45]

Similarly, Weasel's adoptive grandfathers tell him.

"You will in no possible case whatsoever sleep in a straight burrow," (they) told him, "and you will sleep in a crooked burrow."

The incorporation of parenthetical ideas is characteristic of many passages. Here, as in the case of parallelism, the Shoshone language is largely responsible. Polysynthesis combines many elements into a single word, which the speaker can readily analyze e.g., *u-gë-rĭ-ka-'ma-xwa-c*, equivalent to ten long English words, "having just finished destroying something (or someone) invisible by eating with teeth." Syntax also permits the loose joining of such catch-all words to the substance of the sentence by prefixed personal pronouns. It matters little that the logical connection must often remain obscure. One may translate "urëmi'wiak—wĭ' du:'wunaix" by "as they are walking—because they are walking—, in their walking—, a black spot appears." Syntax likewise permits demonstratives to assume relative functions; a single, compound demon-

[44] From Tassitsie's "Mourning Dove Rescues her Child."

[45] From Pivo's "Weasel's Adventures."

strative may tie two or three independent clauses. For example, Coyote directs:

> Ke gĕmbu"it ke dŏ'as wŏ'sĕgĭndar! *su'kura* bu"iha dŏ'as wŏ'sĕgĭndai gu'tido!
>
> (Don't be lookers or peekers either! *At kim whosoever* might either look or peek someone will shoot!)[46]

Finally, even completely disjointed flows of thought are but extensions of good Shoshone usage. Thus, when Coyote has started his Circle Dance, he watches the participants,

> "It is he now—as they are dancing the foremost one of them appears fat—he is now looking at that fat one."[47]

The principal *mechanisms for achieving variety of expression* are synonyms, metaphors, similes, and special phonetic and syntactic alterations. Only the first of these mechanisms will be discussed here. A later section on visual imagery will take up metaphors and similes. Among the Shoshone the non-functional phonetic and syntactic alterations are devices of poetry and not of prose. Consequently, the section on poetic songs will deal with them.

Synonyms of slightly differing meaning abound in Shoshone. They may have entirely different stems as in some nouns, e.g., *"nɔ:r"* (ridge), *"dɔ'ya"* (mountain), and innumerable verbs, e.g., *pĭ'di* (to arrive), *gim* (to come), *gɔ''i* (to return), *ya 'i* (to enter), *dɔ 'i* (to enter or go out). They may simply vary suffixes. For instance, many interchangeable verbal suffixes express continuous action, e.g., *mi' ano*: (he keeps on going), *mi 'axant* (he is in the state of going), *mi' agwai* (he is gone, and will be gone indefinitely). Nouns, pronouns, adverbs, and adjectives may also receive modal suffixes for emphasis or depreciation, e.g., *nĭ'ʒa* (I, indeed), *nu:'nĕ* (I, perhaps). They may change from independent words to adverbial or adjectival prefixes of the same stem. Semantic differences often accompany such changes. The word "na'riand" (dangerous), for example, combines with the verb meaning "to fall," and yields a compound *na'ria'ani-* (to faint in horror); but it also combines with the verb meaning "to cause to think," and yields a compound *na'riasu'aŋg-* (to esteem). Finally, they may form completely different grammatical structures. Thus, emphasis may be expressed by suffixes of many sorts added to the words stressed, or by the use of the negative particle and the unreal mood. An illustration of the last method is the following: *ni'ʒa ke ha'gap ĕngai''iwait* (It is impossible that I shall not be a stayer with you, i.e., I will remain with you at all costs.)

The Shoshone narrator and his audience are extremely interested in words as such, and extremely appreciative of good usage and accurate shading. They demand both idiomatic and exact expressions. For example, Guy Robertson, an older and more conservative man, scornfully rejected Lynn St. Clair's anglicized description *tom'boniwaiki* (in a circle) as an innovation for the correct *gu'na hɔ' ig* (around the fire). Both narrator and audience quickly grasp the delicate nuances of thought expressed by slightly differing synonyms. Almost every expression, every word, indeed, may have its peculiar connotation, unique, yet lucid. In short, variety of expression, especially when coupled with parallelism, is a main artifice of the Shoshone litterateur. It is an artifice, however, which no outsider can truly appreciate; translation grasps its shadow, not its substance.

Visual imagery accentuates important aspects of the action or background of a myth by making them especially vivid and picturesque. The Shoshone narrator uses three types of such imagery: direct descriptions, metaphors, and similes; pantomime is an occasional accompaniment of anecdotes. Descriptions of emotional scenes and of tool-making are very common, as preceding pages have shown, but other descriptions are exceedingly rare. Thus, there is only one representation of a landscape in all my material. Its simple beauty makes quotation worth while. When Weasel and his brother approach the "Water-Buffalo's" lair, the narrator describes the scene thus:

> Here is water
> Here is the Water Buffalo's lair,
> Here is blue-edged water
> Here many trees are standing.[48]

[46] From Tassitsie's "The Hoodwinked Dancers."

[47] *Ibid.*

[48] From Pivo's "Weasel's Adventures."

Simple metaphors abound in Shoshone myths. Most of the animal characters are called both by their ordinary names and by descriptive terms, some of them derogatory. For example, Beaver is sometimes known as Big-Tail Owner; Bat, as Tobacco-Black-Mouthed One; Coyote, as Daylight Anus. Actions also may be metaphorically depicted. For instance, when Bat runs fast, he "becomes a white streak." Similes occur less frequently than metaphors. Some of them are unimaginative: When Weasel's Elder Brother reproaches the youngster for having disguised himself in Cannibal's skin, he says, "Even if I be like a woman (because he had become panic-stricken and shot at the supposed monster), it is one who might kill someone."[49] Other similes, however, are exceedingly picturesque, e.g., hospitable Owl's piercing of his eye causes nutritive liquid to "flow from it like egg yolk."

It is hard to know what emotions myths arouse in Shoshone audiences. Only direct observation can tell us. The *emotional significance* of a given incident may be very different to them and to us. Elsewhere, I have told how two of my informants found great amusement in a very grim account of a murder.[50] Where most of us would only have seen horror, they saw ridiculousness. Because of these differences in reactions, I will discuss here only those manifestations which I have actually seen.

Humor is an important characteristic of Shoshone tales. To achieve it, the narrator most often establishes ridiculous situations, relates pranks, tells obscenities, or plays on sounds. A rarer technique is irony, which may be illustrated by Weasel's conversation with Monster Owl. The boy is gorging himself at a forbidden hour, while she watches him silently. He offers her some meat, then taunts her for not taking it:

"Why, are you going to become sick, having come to me on purpose?"[51] She claws at him suddenly, but he avoids her, and scoffs, "You're clawing as though for a husband!"

Most listeners find the battle scenes of the tales tense and exciting. They are sympathetic toward such mothers as Mourning Dove, who yearns for her lost child, or such brothers as Weasel, who fears for his brother's safety. Coyote's perversions and vilenesses arouse revulsion in some.

Few special *devices of mythical significance* are found in Shoshone tales in comparison with those of many other peoples. The recitatives of the Southern Paiute[52] and Eskimo[53] have no parallels among the Shoshone, nor do the special voices and intonations peculiar to Nez Perce myth.[54] The mythological era is not emphasized as distinctive by the use of any special, indefinite mythological verbal aspect,[55] or the habitual use of a quotative—"it is said"—[56] or by specific reference, e.g., "already only a short time away the human race comes."[57] No special mythical sentence structure exists.[58]

To be sure, Shoshone myths do have some artifices of this type. There are special mythical names for some animals. Weasel is called "pë′përang ugupë" (which I cannot analyze) rather than the usual *pa:′βiǰi*. Various fantastic beings likewise have unanalyzable names, e.g., *gip*, a "water-buffalo," and *honowikhono*, a "buttocks-bouncer." Some, like the Water-Ghost-Beings, make characteristic noises, e.g., *wi:ho*! In addition to the peculiarities of name-giving, the myths have a stock of stereotyped actions and situations. Illustrative of a whole series of awakenings from death is the following incident. Bat has restored Coyote from death by frightening him with his magical arrows. The latter does not appreciate the true situation, and grumbles:

"Darned Bat, Tobacco-Black-Mouthed One! When I had been sleeping well, he woke me up," Coyote said it.

[49] *Ibid.*
[50] SHIMKIN, "Psychological Studies, etc."
[51] From Pivo's "Weasel's Adventures."
[52] SAPIR, "Texts, etc." p. 414 ff.
[53] K. RASMUSSEN: *Iglulik and Caribou Eskimo texts*. Rep. 5th Thule Expedition, 1921–24, 7: (3). 1930; p. 36ff.
[54] A. PHINNEY: *Nez Perce texts*. Columbia Univ. Contr. Anthrop. 25: 1934; p. 10 ff.
[55] M. LEENHARDT: *Le temps et la personalité chez les Canaques de la Nouvelle-Calédonie*. Rev. Philosophique 62: 43–58. 1937.
[56] E. DELORIA: *Dakota texts*. Publ. Amer. Ethnol. Soc. 14: 1932, p. 1, n. 2.
[57] PHINNEY, *op. cit.*, p. 26.
[58] Z. HARRIS and C. F. VOEGELIN: *Hidatsa texts collected by Robert H. Lowie*. Prehistory Research Series 1: 173–239. 1939; pp. 231–232.

"No. You were not sleeping. You were killed. Look at your hide," (they) said it. Then as he looked at his own scabby hide, he felt badly.[59]

Other stereotyped actions are reviving a comrade from death by rasping a wild rose branch[60] vigorously in his mouth or anus, killing a monster by shooting him in the anus with a firedrill, fooling a monster with flies in a pot which buzz like human voices, or taking refuge from him by shrinking magically and hiding in a friendly relative's nose. A final device of mythological importance is the persistence of some animal characteristics in the personalities of the main actors. Thus, Badger can burrow underground and Kingfisher can fly.

THE NARRATOR AND THE MYTH

An understanding of the relation between narrators and the myths they tell demands study of the nature and degree of changes introduced in tales by different tellers, and the extent of correlation between such changes and various personal idiosyncrasies. Ideally, research into this relation should include, on one hand, a wide sampling of tales collected in text, with numerous fully comparable variants, especially from key individuals; and, on the other hand, thoroughly documented sociological and psychological data concerning the tellers and their places in the community.[61] Our materials fail lamentably to achieve this ideal. As a matter of fact, the comparable variants included in them were taken, unfortunately, in two different languages, Shoshone and English. Truly accurate stylistic comparisons were thereby made impossible. Seven informants on mythology out of a population of eleven hundred souls represent only a minute sample. Furthermore, none of the collections from these informants is by any means exhaustive.[62] Finally, while the sociological and psychological data concerning the informants are relatively abundant, they are largely incomparable from individual to individual, and are often impressionistic. In short, only the importance of the subject justifies the following completely tentative presentation.

Variations in the stories follow one principal line of cleavage according to the status of the narrators. The sections of this paper have been based upon the works of my major narrators, George Guina, Moses Tassitsie, and Pivo Brown. The stories of such minor narrators as Polly Shoyo, Pandora Pogue, John McAdams, and Charley Nipwater are but simplified and abbreviated reflections of the better and fuller versions. They differ from the better versions in reducing plots to one or two incidents, in simplifying characterizations into such single, absolute qualities as malice or greed, and in avoiding stylistic elaborations other than repetitions of actions and descriptions by enumerating details. They may even omit the magical formula for warm weather.

A comparison of two versions of Blind Coyote shows clearly the attrition which tales suffer at the hands of a minor teller. The version of major narrator "A" is as follows:[63]

> Coyote learns from some chickadees the art of throwing his eyes at trees to fetch luscious wild-carrot roots. Unfortunately, he forgets the directions that the birds have given, and throws his eyes at a fir tree, where they stick henceforth. Blind Coyote now wanders helplessly on the prairie until, by accident, he runs into two girls. He strikes up an acquaintance, and goes with them. The girls see some buffalo and ask him to shoot them. He, not wishing to let them know he is blind, says, "Yes. When you see me far away, you can drive the buffalo toward me." Then, when they are far away, he starts shooting everywhere and anywhere, pretending he can see. By chance he kills one beast.
>
> The girls return and see the arrows sticking in the ground all around him. They pull them out, give the arrows to him, and ask him what he has

[59] From Pivo's "Bat Hunts Mountain Sheep." Compare this stereotyped situation with that found in Wintu myths, cf. D. DEMETRACOPOULOU and CORA DU BOIS: *A study of Wintu mythology*. Journ. Amer. Folk-Lore **45**: 373–500, 1932; p. 380.

[60] This plant was formerly placed on the chests of the deceased when they were interred.

[61] Such studies have long been a basic objective of the Russian Folkloristic school. For brief discussion of their methods and results see M. ARADOWSKIJ: *Eine sibirische Märchenerzählerin*. "F F Communications," No. 58, Helsinki, 1926, pp. 5–23; J. M. SOKOLOV: *Sovetskii Fol'klor*, Moscow, 1938, esp. pp. 34–123.

[62] Further data on all these individuals will be found in SHIMKIN, *Psychological studies*, etc. in his *Wind River Shoshone Sun Dance* (Ms.) and in his *Dynamics of Wind River Shoshone history*. Amer. Anthrop. **44**: 451–462, 1942.

[63] Arbitrary letters have been substituted for personal names.

been doing. "Counting my arrows," says Coyote. Then they notice the dead buffalo, and tell him of it. "Well, didn't I promise to shoot one for you?" responds Coyote nonchalantly.

Similarly, Coyote fumbles his attempt to butcher the buffalo and to build a hut. Each time he covers his error by a wisecrack. Finally, Coyote asks one of the girls to louse his head; while she does so he falls asleep. Soon the girls, curious to find the cause of his quaint antics, raise the band on his forehead. Worms are crawling in his purulent eye-sockets. The girls flee from this horrible sight.

When Coyote awakes he follows the girls in all haste. But one of them throws her rattling ornaments over a cliff. Coyote follows the noise, falls off the cliff and breaks his leg. From the top of the cliff the girls watch him and mock, "Look at Coyote, he's broken his leg." Indignantly, Coyote replies, "What are you girls talking about? I'm just eating mountain-sheep meat."

After a while, a chickadee helps blind and crippled Coyote by making him a new, wooden leg. Coyote now travels in search of his older brother, Chief Eagle, whom he eventually finds. Eagle soon discovers Coyote's trouble and puts a mountain-sheep's eyes in the empty sockets, thus restoring the sight. The recovery makes Coyote so happy that he starts howling in joy, as coyotes have done ever since.

The variant of minor narrator "B" shares with this the introductory incident, the travel with the girls, their flight, and Coyote's chase and fall over the cliff. But it fails to develop the humorous possibilities of blind Coyote's doings, to introduce smoothly the discovery of his blindness or to explain plausibly the girls' cruelty toward him. Furthermore, it ends abruptly, leaving Coyote at the bottom of the cliff, failing to explain how he recovers his health. The tale is neither finished nor humorous, lacking artistic and etiological point.

As Coyote is going in the brush, he hears a noise: "Eyes! eyes!" He peers and sees Porcupine. He asks the latter what he is doing, and Porcupine answers: "I throw my eyes at the red-willow tree, and they return, bringing me wild carrots. That's how I get my living."

So Coyote imitates him and lives very well for a while. Eventually he forgets Porcupine's instructions and throws his eyes at a yellow willow. They stick to it (there they are yet).

Coyote finds two girls as he is traveling hiding his blindness with a rawhide cap over his eyes. He lifts the cap and asks the girls what is wrong with his eyes. The girls see worms, are horrified, and want to leave him. He insists on following them, saying, "You just rattle the bells on your blanket."

"Yes," they reply, and throw the blanket over a cliff. He follows the sound, falls over, and breaks his leg. He gets a stick, rams it into his leg to get at his own marrow, which he proceeds to suck. He says, "Look at what I am eating."

But the girls continue on their way.

In general, the minor versions are but poor editions, without originality or artistry. They may be attenuated to the point of retaining but one detail out of a long narrative. For instance, minor narrator "C" isolated the encounter of Grease and Coyote from the entire elaborate story of Coyote, Grease and Bobcat. Such extreme attenuation may also result in a secondary, jumpy recombination of the fragments, as in narrator "D" 's jumbled miscellany of four myths (The Hoodwinked Dancers, Blind Coyote, Wolf and Coyote, and Porcupine crosses the River).

Coyote starts the Ghost Dance. When Coyote begins it, they dance for a week. All of a sudden, he goes blind, having thrown his eyes at some trees, which have warts to this day. He goes around with a buckskin over his eyes. Finally, his wife says, "What's wrong with you? You go around feeling everything." When he falls asleep, she lifts the bandage and sees worms in the sockets. So she says, "No wonder you're blind. What happened to your eyes?"

Coyote awakes and replies that he threw them in the brush.

Eagle, Coyote's mother's brother, ponders: "That boy can't see. I'll try to rustle him a pair of eyes." So he flies away to kill a mountain-sheep and take out its eyes. These he puts in Coyote (that's why coyotes have eyes like those of mountain sheep).

After his sight is restored, Coyote gathers all the animals in one place. He gets up and announces, "What will each of us be? Everyone name what he will be."

Porcupine decides to be a porcupine and kill with his quills. He kills buffalo by crawling inside them and piercing their bellies. Then he eats them.

Lesser differences occur within the two basic groups of major and minor variants in the tales. Those existing in the stories told by major narrators are worth analysis.

All the major narrators are perfectly cognizant of the structural requirements of properly told tales, the outstanding traits of the principal characters, the significant happenings of mythological times, and the most popular literary devices. These factors they hold surprisingly constant. They feel free, however, to vary their combinations,

to embroider the basic patterns in various ways. Through such variations, apparently minor, arise considerable differences in the artistic unity and effectiveness in the total emotional and ethical flavor and in the rounded psychological pictures of the actors. For example, narrators "E" and "A" recounted the basic elements of the story of Owl's Widow identically.

Because her husband, Owl, is stingy with food, she kills him by planting a poisoned rabbit bone on which he steps. Before his death, he implores her, on their little son's behalf, not to marry his brothers Skunk, Badger or Coyote, all of whose children are mean and would kill the boy, but to marry youngest brother Sparrow Hawk, a bachelor. After she buries her husband, Owl's Widow goes on her travels. Immediately, however, she disobeys her deceased spouse's injunctions by visiting Skunk's home. However, Skunk's mother warns her to leave at once, which she does. Unfortunately, she drops a piece of her shawl which Skunk notices on coming home. He becomes infuriated that Owl's Widow has dared leave him, and pursues her and her son, but cannot reach them on the slippery ice. Just as they are escaping he kills them with his stench.

In some way, magician Badger learns of Owl's Widow's death and goes in search of her. After finding her, he restores the woman and her child to life. Then he gives her good advice. She pays him for his services and goes on to Sparrow Hawk's home. Having arrived there, she is greeted by Sparrow Hawk's mother. Soon Sparrow Hawk himself comes home with but one little rabbit. Once he has brought his game, he flies away to his nesting place on the cliff.

Meanwhile, Owl's Widow doubts the wisdom of her choice, for Sparrow Hawk seems to be a poor provider. Coyote, coming by, scornfully reinforces her doubts. She, however, finally puts the rabbit in the ashes to cook. Behold! the single rabbit has quadrupled. All eat, and still there is much left over.

This wonderful feat reassures Owl's Widow, who now follows her new mother-in-law's instructions. When night has come, she climbs up to Sparrow Hawk's nest, and embraces him. He yells mightily, so that Coyote, running up toward the source of the noise, starts shooting arrows at the intruder. However, Owl's Widow smears mucus on her mate's face, which immediately quiets him. Coyote, coming within sight, sees what they are doing, shrugs his shoulders, and goes home.

Narrator "A" added several details to his version. Badger's fee for his services is sexual intercourse. Owl's Widow disobeys instructions again, is killed again, and revived again for the same fee. In addition, Narrator "A" does not introduce Coyote's insulting remarks about Sparrow Hawk's hunting ability until after the successful mating. The insult leads to a quarrel, in which Sparrow Hawk shoots a fire-drill into the ground, setting the earth on fire. Coyote burns and Sparrow Hawk relents. This ends the story. Narrator "A" 's additions underscore Owl's Widow's obstinacy and stupidity. They allow more elaboration of erotic detail. His transposition, however, materially weakens the story, which shunts aside its main theme and main actor to end disjointedly in an anticlimax.

Narrators "E" and "A" told the story of the Bungling Host in a very similar fashion. But the former's version allows Coyote the return of one of his children from death, and ends the tale, not with a fight between Coyote and Mountain Sheep, but with Waxwings telling Coyote's wife that the fool would return with four little waxwings after his guest's departure. These two changes give "E" 's tale a kindly and humorous rather than a sardonic cast.

Finally, "F" 's and "A" 's renditions of Weasel's Adventures provide strong contrasts in the development of the plot, the flavor of the story and the character of the hero. The principal theme, of course, is the same.

Weasel and his Elder Brother go hunting the Water-Buffalo. On the way, despite his brother's objections, Weasel encounters and kills several monsters, pushing one off a cliff, defeating another in a wrestling match, and destroying a family of them by throwing them off a swing. Finally the pair gets to the Water-Buffalo's lair. The elder brother swims under water after the beast. Weasel, watching from shore, becomes hysterical from anxiety and flees into the sand hills, where he dies of thirst. When the elder brother returns with the slain beast, Weasel is no more. However, two grandfathers, who are passing by, come to the rescue, find Weasel and restore him to life. Before leaving, they warn the two brothers against building a fire in the locality at night, lest Monster Owl see it. Nevertheless, hungry Weasel does so that night, and is kidnapped by Monster Owl for his pains.

In "F" 's version, however, Weasel's trickster character is made far more explicit than in "A" 's by introducing such escapades on the hero's part as pricking the testicles of an unsuspecting grandfather with sharp-pointed grass. In "F" 's version, likewise, the encounter with Monster Owl is

heroic, with Weasel killing the bird by a stratagem; in "A" 's, it is mock-heroic. Two mouse-grandfathers drive Monster Owl from his perch, kill him with smoke, and then extract Weasel from his belly. After that, they revive the bird by rasping his throat vigorously with a wild-rose branch. He awakes, and grumbles that he has been roused from an excellent sleep. Then, all the characters part amicably. Finally, Weasel's transformation of character after leaving Monster Owl's island occurs only in "F" 's tale. "A" has no parallel to "F" 's account of Weasel's new obedience, new benevolence and new timidity, nor of the reconciliation with his brother.

In brief, "F" 's manner of narration is far more mature than "A" 's. It stresses the development of the hero's character and his gradual chastening by experience. It is well integrated and dramatic at the same time. It utilizes a great range of incidents and artistic devices. In contrast to this, "A" 's version emphasizes events rather than characters. It has no moral implications; in fact, its tone is rather flippant. It uses the same tricks and the same buffoonery time and again. Artistically it is incomparably less mature.

What individual differences of environment or temperament lie behind differences in story-telling ability? My limited data suggest three categories of concomitant variations: correlates of marked educational (acculturative), intellectual, and temperamental differences.

The poverty of "B" 's tales seems primarily to reflect his limited knowledge of Shoshone traditions and artistic standards. He is half white; he has received some school training, and has worked for the Agency and other white employers at various times. He has traveled extensively. Consequently, though he has retained many typical Shoshone beliefs, he has also assimilated ideas from other sources. For example, he interlarded an intelligent and authentic account of various Shoshone ceremonies with a description of the Hopi Snake dance. In like manner he often confuses various facts of Shoshone culture. Thus, in construction and style his mythological tales are almost indistinguishable from his versions of the fantastic, often pointless, boastings and stories of wonder which comprise the Shoshone anecdote.

"D" and "A" furnish a contrast especially in intelligence. In their responses to the Rorschach Test they manifest a few likenesses and many differences. On one hand, they share a synthesizing but pragmatic approach to experience; neither of them attempts an escape from reality by yielding to excessive concern over minutiae or by negativism. Furthermore, inner drives, conscious or unconscious, appear to activate them but feebly. These narrators are both genuine extroverts who find their significant stimuli in other persons or in their environment, not in themselves. Neither is sharply analytical or critical in outlook, and consequently, both are somewhat over-expansive and over-impulsive. On the other hand, "D" is, in comparison with "A", far less active, far less responsive to stimuli of all sorts and much more set in her ways. (Her age, one must remember, is over eighty; "A" 's approximately half as great). She is mentally stereotyped and unimaginative. Possibly, she would persevere in her narrative and imaginative habits even more doggedly than she does, had she greater energy. He is mentally more alert. His responses are varied and, within the limits of ordinary ability, rather imaginative and original. She is emotionally rigid; her emotions come in outbursts. He is emotionally pliable, his modes of expression run the gamut of friendliness, sensuality, and sheer, uncontrollable passion or rage. Finally, she shows few signs of anxiety. He, however, has many worries, some of which he seems to have solved rationally. Others are still active, and appear to give rise to moderate hypochondria. In short, both "D" and "A" are ordinary, normal human beings. But "D" is inactive, stolid and dull; "A" active, sensitive and original, but of smaller mental stature than either "F" or "E". The differences in the story-telling ability of these two persons appear largely to arise from differences in their intellectual ability.

The differences between "C" and "F" are of a complicated nature. Both are highly intelligent people who can express themselves very well indeed. "C" excels in her

ethnographical narratives and her anecdotal stories, such as the one concerning the Weakling and the Female Bear, which are as fully descriptive, vivid and elaborate as the best mythological tales. "F" related an absorbingly interesting autobiography as well as the best versions of the myths. How is it, then, that the two differ so greatly in the quality of their myths?

To the best of my knowledge, the difference reflects that between their basic personalities. "F" has led a satisfied and happy life; he has achieved love, honor, and power. In his old age he is quiet, relaxed, and wise in the ways of the world. He has mastered discipline and tradition; he has learned the tales to perfection. Now, as an adept, he can mold them at his will, infuse them with his wisdom and with the warmth of his personality. So he points out morals, delineates truly living characters, and softens the brutal harshness of the myths. But since he has had many outlets to his energies throughout his life, he does not seize the myth as a means of emotional expression. He detaches himself from its context; calmly he polishes his tale to balanced, clearcut beauty. It is a beauty of age and warmth and kindness; it is not a beauty of stark, searing-hot emotion.

"C", on the other hand, has led a life of extremes, of great happiness and complete gloom. She was loved and protected by her grandmother; she was abused and beaten by her husbands. Her children died young. Discipline has passed her by, and outlets of achievement and satisfaction have been denied her. Consequently, her emotions control her, drive her. She talks restlessly, incessantly; she has little use for formal rules of storytelling. Quickly her keen mind recalls the point of an obscure tale crucially bearing on her argument or her complaint. Instantly she tells it, stripped naked of all dross. She cares not at all that others fret at the invitation to stormy weather she has thus introduced. Or she may pause, describe with great fidelity, with infinite care, the tiny details of daily life impressed upon her very soul by years of arduous toil; or dwell on tender memories of dauntless warriors who stirred the heart, of beauteous fops who stormed yet other parts—then, in an instant, drop it all, grumble about the damned world's worries and then be off once more. In just the same way, she alternates joyful, hopeful tales of marvelous aid to the unfortunate with sardonic, gloating anecdotes of suffering and death. She swings from uncritical, naive belief to hard-boiled cynicism. Is it any wonder that the strict formalism of Shoshone mythological tales has failed to catch her restless spirit?

ANECDOTES

In addition to the myths proper, the Shoshone relate a mass of inchoate tales that may best be classed as anecdotes. Essentially they are realistic stories believed to be true and concerned with human beings. In contrast to the myths they are often precisely localized. The wondrous happenings which occur in them are all within the ken of Shoshone reality; anthropomorphic animals are rarely mentioned. Anecdotes have no recognized literary form (as verified by versions in text).

Such tales are the especial delight of young men. Many of them are personal adventures, often picturesque "whopping" lies not meant to be believed. Braggadocio is frequently evident, especially in tales of great erotic feats which resemble in content and psychological role the limericks of modern American culture.[64] Attitudes toward these tales vary. Most men relish them, but some, especially those who have been most imbued with White moral teachings, are embarrassed to hear them. Rarely, a more serious motive enters. Lynn St. Clair told me how one man defended himself when accused of murder. He had gone through the dry country near Owl Creek with his friend, but only he had returned. He gave the following story.[65]

They had been hungry and thirsty. Finally, they came upon a big rattlesnake. His friend killed it and thought that they might eat it. The first man refused and walked ahead, reaching a spring.

The other followed, still holding the snake. When he got to the spring he cut off the snake's head. He skinned the snake and cooked the

[64] W. LABARRE: *The psychopathology of drinking songs.* Psychiatry, 2: 203–212. 1939.

[65] This is a widely spread Plains story in attenuated form.

meat. It was nice looking, so he offered some to his companion (the narrator) who refused.

When they went to bed, after one had finished his snake, the other slept apart because he was afraid. After a while he heard a rattling from where his friend was, so he moved farther away. This happened several times. In the morning he looked, but his friend was nowhere to be seen; he had turned into a rattler.

No one believed this story, however, and he was accused of murder. Yet no action was taken. Many years later some Bannocks saw an enormous rattlesnake at the very spot of his story. The accused seemed vindicated.

In general, the boundary between belief and disbelief in regard to anecdotes is vague and shifting. To illustrate this fact, an examination of one narrator's attitudes is helpful. He told this in all seriousness.

My wife, my boy and I went out camping' hunting elk. In the night I dreamed I couldn't kill an elk. Just couldn't get him. The next day I shot all my cartridges at a spike buck. He stood still, but I couldn't hit him. I asked my boy for an ax, and finally got (killed) him. I dreamed about a woodchuck the same way. Now I won't go hunting.

He told this as a joke:

One fellow told me, 'My friend, you know what I did once? I was sweating in the mountains. I saw a creek, took off my clothes, then crawled into the water, leaving my clothes behind. Finally I heard a little noise. There was a bear, with all my clothes on. He had a gun in his hand, and was pointing it at me. I said, "Partner, you ought not to do that. Better take your clothes off." So he stripped and I dressed again. I told him, "You wait." I got a bridle, put it on him, and rode him until I reached my house!

But this again was serious fact:

One of my uncles was a bear charmer. One time my uncles got to chasing a bear which got away from them. They talked brave. "Bring that bear out by the ear," said my uncle. None would do it. He, Ed Bazil, then went into the brush, and found the bear lying down. He told it, "I'll take you to the people." And he led him out by the ear. He wouldn't kill it and the people were afraid to. So they let it go.

In terms of origin these anecdotes may be grouped as follows: narratives of the work-a-day world, tales of supernaturally endowed persons and supernaturally dangerous localities (based on current religious and superstitious concepts), myths from the Plains, and modified European fairy stories.

A good illustration of the first class is the story Tassitsie volunteered after we had been discussing smoking customs for some time:

One time we were moving away from Owl Creek along Big Wind River, among the big cottonwoods. We young fellows would all go in a bunch and surround rabbits, shooting them down with arrows. It happened this time that another fellow and I killed none.

We rode some distance, then came upon four old men sitting down, facing the east. They were He-cries-in-the-night, Na'šawiki, Dear-little-big penis, and Horse's-Mother's-Father. They asked us if we had killed any rabbits; we said "No."

We lingered a little. Then one of these men wanted to smoke. He said, "Someone fill a pipe for us and let us smoke." He-cries-in-the-night had a pipe, strange, rough and unfinished, but quite large. He filled it up.

Dear-little-big-penis took off his moccasins. There was some grass there. He pulled it out to make the ground smooth. He drew a ring and dug a hollow in the middle. Then he asked for a match, but none of the men had one. So he reached down in the quiver and drew out a fire drill hearth: on its edge were three or four round holes, blackened. He took a drill out of the quiver.

They coaxed one another to make the fire. Two fellows held the hearth finally, while Big-penis twirled. He took some tinder—where from I did not notice. Then he tore some off another large piece. About the fourth time, they said, "Now the fire has dropped on to the tinder." Dear-little-big-penis picked it up, started blowing. He lit the pipe and started smoking. Then he handed the pipe toward his right to He-cries-in-the-night.

The men had been sitting on a bank of hardened snow above a gulch. Now He-cries-in-the-night smoked for quite a while. He started wobbling. The next man snatched the pipe away, but He-cries-in-the-night fell over the ledge to the bottom.

They kept on smoking; paid no attention to this. After they were through, Dear-little-big-penis took the pipe and dumped the ashes into his ring. He worked them in until they disappeared. They now told Na'šawiki, "What happened to our friend? You go and see." They then cast the work on to each other for quite a while. Finally, after Dear-little-big-penis had put on his moccasins, he got up to see what happened.

They saw a puddle of blood. He-cries-in-the-night had fallen on his hooked nose, and skinned it badly. He had fainted. Dear-little-big-penis picked him up and tore the skin off his nose. The others stood around joking. He-cries-in-the-night came to, then washed his wound in a warm spring fifty yards away.

Afterwards his nose turned black.

Tales of supernaturally powerful persons tell of their acquisition of power, of their

relations with their patrons, or of the miracles such persons can perform. For instance, the great chief Washakie received power from the dwarf *nïnimbi* after rescuing him from attack by an eagle. This incident is one of John McAdams' favorite anecdotes. Again, Tassitsie was much impressed by his friend Gun-Owner, a snake charmer.

The two were going on foot by North Fork. Suddenly Gun-Owner said, "Friend, I have left my dog here. I don't know if he's still there." He stopped by a rock pile, where Tassitsie saw a rattler, and ran away. A little later Gun-Owner caught up with him, and once more the two walked on. When they had gone a little way, a rattlesnake's head suddenly peeked from beneath Gun-Owner's blanket. The snake saw Tassitsie and began rattling, but Gun-Owner held on to it calmly. Then the two crossed South Fork, and ended their walk. Now Gun-Owner grasped both jaws of the snake and stepped on its tail; now he handled its fangs, showing them to Tassitsie. These were easily pulled out, he remarked. Having pulled the fangs, he let the snake go.

Finally, Polly Shoyo told a remarkable incident:

This is a true story. I knew a man named Sticky-Hair. Once, he took off his moccasins, stirred the ashes of the fire place, placed his moccasins in it, and covered them with ashes. Then he lay down to sleep. A little later he asked his wife to look at the moccasins. They had turned to buffalo tongues!

Of all sacred places, Bull Lake, "Water Buffalo's Crying," was the most feared. Many lost their lives here to the monster in the lake. Well known, in many variants, is the following account:

Two friends came to Bull Lake. They saw a bull come out of the water; they killed it. They made a fire, cooked some of the meat on it, and started eating. One man ate only a little, and slowly. The other kept on cooking the meat and eating it.

They were sitting back to back, one facing the lake; the other, the mountains. The former let out a bellow like a bull. The latter, frightened, ran up the hill. Soon the former arose and walked into the lake, right into the water. That was the last ever seen of him. (Polly Shoyo)

Typical Plains myths involving human characters seem but elaborations of these Shoshone beliefs concerning supernaturally powerful persons and supernaturally dangerous localities. Representative of the Plains myths found at Wind River is the story of the woman and the buffalo bull. Well known from other tribes, it need not be repeated here.[66]

European fairy stories are not at all uncommon among these people. Unfortunately my records of them are fragmentary and haphazard. The adjustment of fairy stories to Shoshone tastes and habits can only be hinted at. Thus, John McAdams identified the story of John the Bear,[67] which he had heard in New Mexico, with the local tale of the Weakling and the Female Bear. He had pruned away all incongruous elements.

Bears in hibernation store choke cherries and all kinds of roots, just like pack rats. People have seen this. One Shoshone came as a lone survivor from a war party, freezing and starving, into a bear's den. He saw something like lights (these were the bear's eyes) and he heard growling, but he laid himself down beside the bear, and she liked it. So he wintered there.

In the spring, however, she continued to keep him prisoner, blocking the entrance of the cave with a big rock whenever she would leave. Once she was careless, and he was able to squeeze out and escape.

After running for a long while he came to some of his fellow tribesmen who would have nothing to do with him until he washed and cleaned himself with mud, for he stank like a bear. Just then the bear came, pursuing him. The man's life was saved by the war chiefs, who surrounded the bear, and killed her.

Dick Washakie knows the Indian.

I heard the same story from New Mexico with the difference that it was a male bear who impregnated a girl. Finally, she escaped when her son, at ten years, had grown large enough to handle the rock barring the entrance of the cave. The bear, trailing her, was killed by the Mexicans, who ambushed him. The little cub was just like a human being, but stout. He's still living.

I've never heard of animals other than bears having intercourse with people.

[66] E.g., R. H. LOWIE: *The Assiniboine*. Amer. Mus. Nat. Hist. Anthrop. Pap. 4: 1909; p. 213.

[67] The principal sources on John the Bear are S. THOMPSON, *European tales among the North American Indians*, Colorado College Publ., Language Ser., 2: 319–471. 1919; *idem, Motif-index of folk-literature* 1 (F F Communications No. 106, 1932); J. M. ESPINOSA, *Spanish folk-tales from New Mexico*, Mem. Amer. Folk-Lore Soc. 30: 31–49, 1937; and R. F. BENEDICT, *Zuñi mythology*, Columbia Univ. Contr. Anthrop. 21, pt. 2: 32–35. 1935. The basic Plains story of the weakling and the female bear is also given in R. H. LOWIE: *The Assiniboine*, Amer. Mus. Nat. Hist. Anthrop. Pap. 4: 1–275. 1910; *idem, Chipewyan tales, ibid.* 10: 194–5. 1912.

POETIC SONGS

So far as I know, true poetry occurs among the Wind River Shoshone only in songs.[68] Most of these are meaningless vocalizations, as in the Sun Dance, war songs, and Peyote songs, but some have intelligible verses. To this latter class belong Ghost Dance, mocking and gambling songs, as well as songs with popular American tunes but Shoshone words. Unfortunately, I have examples of only the Ghost Dance and mocking songs from the second class.

Elsewhere, I have discussed Sun Dance songs in some detail;[69] war songs are much like them. A brief text will illustrate the typical vocalizations of Peyote songs. They are sung during the ceremony with the accompaniment of a gourd rattle shaken about one hundred and sixty times a minute. They are sung in a distinctly falsetto voice; accented phrases rise sharply in pitch, whispered ones drop:[70]

ɔ'haninini ɔ'haninini
ɔ'haneni yana ɔ'haneni yana
ɔ'haneni
yanawe:' yanawe:'
ra'ra yuwanuyana hininu•

The Ghost Dance, which the Shoshone call "Shuffling" (Na'rayar) is a simple ceremony performed during the winter months at full moon, and two or three nights thereafter. Its purpose is to shake away illness. Other, closely related dances, such as the Warm Dance and the Father Dance, have such functions as improving the weather and averting disaster.

As evening comes a fire is built. Often a pine tree is set up close to it. A leader stands by the fire and sings without accompaniment. Another replaces him when the first tires. Around the fire and the leader is a ring of dancers, men and women alternately. The dancers dance clockwise, dragging their feet sidewise, holding hands with intertwined fingers. Their only special article of dress is a blanket with which they shake away illness. This shaking and a ritual pounding of breasts normally conclude the rite. Periodically, however, and even in recent years, fainting, messianic frenzies, and prophecies have taken place during the performances.

The singers are shamans who dream or or compose their songs. The music is a mere alternation of two themes of simple structure and narrow tonal range sung slowly in a high-pitched, nasal voice. The texts are cryptic descriptions of visions, fully understood only by their authors.[71] These texts are built up of units of single lines which rhyme through simple, final repetition, through alliteration or assonance, or through true rhyme. Two varieties of Ghost Dance texts exist, one, which simply repeats each line, and another, more complicated in structure, which repeats each verse. Some examples follow.

Yellow willow is waving
Yellow willow is waving
Grass, big grass is waving
Grass, big grass is waving
Alder is waving
Alder is waving, etc.

Again:

Sage-brush goose's son
Sage-brush goose's son, etc.

Representative of the second group is

White-rock rivers
All kinds of rivers
Warm rivers (Repeat whole verse)

A final example shows some interesting peculiarities. This is a song dreamt by a powerful shaman now deceased, Frank Perry.

pa:'rutɪ'mbi
pa:'ruɡɪga:"yu
pa:'ɜoni pe'ŋgwinux
pa:'ŋgö maβi'

Water-black rock,
Water-black shining;
Two water-grass fishes
On the water's edge.

In this instance meter and stress are well balanced. The lines are of five, seven, seven,

[68] Shoshone poetry is very simple compared to such sophisticated types as those of the Navajo. Cf. E. L. WALTON: *Navajo song patterning*, Journ. Amer. Folk-Lore 43: 105–118. 1930.

[69] SHIMKIN, *Wind River Shoshone Sun Dance* (MS).

[70] Musical studies of Winnebago and Kiowa Peyote songs by Frances Densmore and Jane Richardson Hanks, respectively, exist in manuscript form.

[71] Compare the shamanistic songs given by Kelly and Natches for the Southern and Northern Paiute. Cf. I. T. KELLY: *Southern Paiute Shamanism*, Univ. California Anthrop. Rec. 2: 151–167. 1939, p. 159, and G. NATCHES: *Northern Paiute verbs*, Univ. California Publ. Amer. Arch. Ethnol. 20: 243–259. 1923; p. 259.

and five morae, respectively. The stresses are on the second and fourth, second and sixth, second and fifth, and second and fifth morae. But such balance is accomplished only through poetic license. In normal Shoshone the adjective precedes the modified noun; the suffix *a'yu* is short and unaccented; intervocalic *m* becomes a nasalized *w*; and so on.

In function and structure the mocking songs differ profoundly from the Ghost Dance songs. The former were composed and sung by gangs of young warriors in derisive serenades of fops who neither worked nor fought in battle, who indulged in extravagances of adornment such as the artificial lengthening of hair with horse hair glued on with pitch, and who—worst of all—could entice all women. The young men would go as quietly as possible in front of the fop's door. Then, suddenly, they would start drumming and singing at the tops of their voices. The music resembles that of the war songs but, unfortunately, I have recorded none of it. The text of one mocking song sung by Tassitsie is as follows:

ẽn ŋga'nhi tɥ'iwiči
mak nẽ hu:'awain^{i}
ke ẽn o'ar ndo'iwaix^{v}
mak nẽ hu:'awain^{i}
ẽn ŋga'nhi tɥ'iwiči
mak nẽ hu:'awain^{i}
ke ẽn o'ar ndo'iwaix^{v}
mak nẽ hu:'awain^{i}
a'ya hanǯ dičir gwẽ'kant
nan mawi:'yahant
dɔ'yawant no:'mia'^{va}
keha nẽ:'cidẽ^{i}
ẽŋgwẽ' gwẽ'pain^{i} nẽ wiǯa wẽn'
du'koβ^{i} utuwek'

You('re) at home, Pretty Youth,
While I a-foresting go
Nowhere to did you go out,
While I a-foresting go.
You('re) at home, Pretty Youth,
While I a-foresting go.
Nowhere to did you go out
While I a-foresting go.
Oh Friend! Bad husband!
Just as well to keep her tied,
Among the mountains (you) keep on moving:
Won't you be ill?
(With) your wife for a wife I would stand,
A black face, bringing it.

The structure of this poem is quite regular, the odd lines having seven morae; the even, six. The even lines, furthermore, are, with the exception of the last, uniformly accented on the third (double) mora. Actually there are three verses here, the first two having the same refrain. The ninth and tenth lines rhyme, while the other pairs of lines share an identical final accentuation.

The term tu'iwiči, basically "youth," has a connotation of foppishness and excessive elegance in direct address and in proper names (cf. pu'hutɥ'iwiči, "Sage-brush-pretty-youth"). The word gwẽ'kant, literally "wife-owner," is poetic license for gu:'xapẽ (husband). The "black face" refers to the facial paint of a warrior who returns from combat after having achieved a battle honor or coup.

THE PUBLIC PRAYER

Public prayer comprises the most serious and majestic phase of Shoshone oratory. It takes place especially in the Sun Dance and the Peyote ritual. It is for the public good, to achieve the release of someone or of everyone from illness, to give them long life, or to accomplish successfully some ritual act, such as cutting down the tree for the Sun Dance outer pole.

Stylistically these prayers (which are not fixed in form) maintain a similar pattern. They begin with an invocation: "All right, my Father, having looked down on us from above . . . " Then follows a statement of the suppliants' condition: they are about to kill the sacred buffalo, to chop down the tree for the outer pole or they are here with a sick man. After this passage the prayer itself, e.g., "May you make him well." Often a prayer for spectators or the populace at large follows, with its statement of condition and its hope. Finally, comes "it is ended."

The prayers of some individuals differ. Quitan Quay is curt and omits the invocation. The prayer which Dick Washakie thought he might give was marked by its highly personal character.

Inasmuch as several of the texts appear elsewhere,[72] a single illustration will suffice for the Sun Dance prayers:

All right, My Father, having looked down toward me from above, by means of you I achieve a benediction. I make a supplication. Here is now a sick man, may you make him well! My

[72] SHIMKIN, *Wind River Shoshone Sun Dance.*

prayer to you also Our Elder Brother Jesus: save him! The person whom you bless, for him your blessing is great. All right, I supplicate. That is all.

The Peyote prayers are peculiar enough to deserve more extended quotation. Gilbert Day prays in this manner on entering the tipi at the beginning of the ceremony:[73]

Our Father, looking toward us, and Our Elder Brother, "lower spirits," all together having looked toward us, may they pity us!

The first person plural here ("exclusive," i.e. "they and I") seems, as in other prayers, to have a general meaning, "everyone." The concept of "lower spirits" is peculiar; I know nothing more concerning it.

After midnight a recess takes place in the ceremony, and the paraphernalia are cleaned at this time. A water-bearer brings in a bucket from which all drink. Then, following some other ritual acts, the equipment is returned to its place, and the leader of the meeting goes outside to blow his whistle to the cardinal directions. He may also pray. Gilbert Day gives a sample text. After an introduction similar to that above, he says:

Eastward steadily, its breeze keeps blowing
Southward, its breeze keeps blowing
Westward, its breeze keeps blowing
Northward, its breeze keeps blowing
All well, here inside let them become!
Finished.

MINOR FORMS

Even every-day life is by no means lacking in little formulas, plays on words, and other elements of unwritten literature. A few examples will give some idea of their use.

When one wishes help from a noted shaman he must address him in a fixed way. With Moguca, Lynn St. Clair tells me, one must say

Prayer-Boy,[74] I have just come for (you); pray for one of us right away!

Then one hands him three dollars and he accepts the case.

Or again, when a child loses a deciduous tooth, he goes to a wildrose bush, digs a hole under it, and drops in the tooth. Then he mutters the following formula:

Wild Rose, you thrived well; in just this way my tooth should grow.

Finally, clever remarks may arise on any social occasion. When I was giving some Rorschach tests, a young man, Meyers Coopooie, cracked this pun on seeing the first plate:

hiniwič u—s hɔ'nɔwič
What is it—'tis Bat!

Members of the household roared with laughter.

CONCLUSIONS

1. The folk literature of a simple culture may be surprisingly rich, varied, and developed. Consequently, in assessing the total achievements of cultural groups with scanty material culture and loose social organization, considerable attention should be paid to their mythology and allied forms of artistic and philosophical expression.

2. The richness of Wind River Shoshone literary forms indicates that comparable developments may exist among the other Plateau Shoshoneans. The meager records available for those groups are no proof to the contrary, since they have been collected largely in English, and often with poor interpreters.[75] Steward's tales imply original mythological forms of considerable length and complexity. Sapir's main informant was a schoolboy, who admitted imperfect knowledge; St. Clair's and Marsden's materials are incomplete and poorly translated. Obviously, a great deal more exploration of this potentially rich field should be undertaken.

3. Among the Wind River Shoshone, the myth, the poetic song, and the public prayer comprise the finest forms of verbal expression. The primary function of the myth is the edification of the audience, while poetic songs are either social, or mystical in character, as in the case of the Ghost Dance songs.

4. On the basis even of incomplete and imperfect materials, it is clear that significant correlations exist between the styles of narrators and their individual personalities.

[73] I have presented the elements of the Wind River Shoshone Peyote Cult in pp. 104–121 of O. C. Stewart: *Washo-Northern Paiute Peyotism*, Univ. California Publ. Amer. Arch. and Ethnol. **40**: 63–136. 1944.

[74] This is an unusual term for shaman. The ordinary word (bɔ'xagant) means "owner of supernatural power."

[75] See J. H. Steward: *Myths of the Owens Valley Paiute*, Univ. of California Publ. Amer. Arch. and Ethnol. **34**: 355–440. 1936; E. Sapir: *Texts of the Kaibab Paiutes and Uintah Utes*, Proc. Amer. Acad. Arts and Sciences **65**: 299–535. 1930; H. H. St. Clair, MS. in Bureau of American Ethnology, etc.

BOTANY.—Veronica connata *Rafinesque*.[1] NORMAN C. FASSETT, University of Wisconsin.

In his *Scrophulariaceae of eastern temperate North America*,[2] Dr. F. W. Pennell took up the name *Veronica connata* Raf.[3] for the plant that he had previously described as *V. catenata* Pennell.[4] This species, he wrote, is the only member of the group in western Kentucky, where Rafinesque had stated that *V. connata* was found, and the description is excellent except for specifying connate and entire leaves, whereas the plant to which Dr. Pennell applies the name has clasping and slightly crenate-serrate leaves.

Prof. M. L. Fernald[5] rejected Rafinesque's name as "very incorrectly or erroneously described and wholly doubtful . . . which was assigned perfoliate and entire leaves such as are not found in our plant." He concluded that the earliest valid name for the species was *V. salina* Schur.[6]

Unfortunately these opinions are more or less subjective. Dr. Pennell emphasizes the parts of Rafinesque's description that apply well, and minimizes those that do not, while Dr. Fernald dwells upon the mention of perfoliate and entire leaves. The question seems to resolve itself into whether Rafinesque might have called the leaves of the plant in question connate and entire.

That the leaves clasp the stem with their bases in contact but not connate is clear from plates 582 and 583 of Professor Fernald's paper, provided only that one has previously examined actual plants under a lens. The writer submitted these plates to several of his colleagues, who are not familiar with the plants, asking, "Are they connate or only clasping?" All agreed that it was hard to tell; several thought that some were connate, especially those of figure 1 on plate 582. Had Rafinesque had such an individual perhaps he would have been justified in calling the leaves connate.

Examination of figure 1 on plate 582 suggests that Rafinesque might well have called the leaves entire. Some of the margins are undulate, but there is scarcely a *bona fide* tooth shown. On the same plate he might have seen at least four unmistakable teeth just above and to the right of the "2." From a study of plate 583 he would probably have decided that the leaf-margins were toothed. These plates represent very well what one finds in examination of actual specimens: the margins of the leaves range from definitely toothed to weakly undulate and practically entire.

If, as Dr. Pennell believes and Dr. Fernald does not, Rafinesque was describing the plant in question and erred in calling the leaf-margins entire, his error was independently repeated by many subsequent botanists with more enviable reputations for accuracy. Robinson and Fernald in edition 7 of Gray's *Manual of botany* describe the leaves of *Veronica anagalis-aquatica* (including the species here under consideration) as "serrate or entire"; Wiegand & Eames, in the *Flora of the Cayuga Lake Basin*, key *V. Anagalis-aquatica* var. *glandulosa* (cited by Pennell as a synonym of *V. connata*) under "leaves entire, or obscurely crenate-serrate"; Rydberg, in the *Flora of the prairies and plains*, describes the leaves of *V. catenata* (the name later thrown by its author into synonymy with *V. connata*) as "finely serrate or entire"; Steyermark, in the *Spring flora of Missouri*, specifies for *V. connata*, "leaves . . . smooth-edged or short-toothed"; and Dr. Pennell's original description of *V. catenata* reads "crenate to nearly entire."

As Dr. Fernald notes, this species occurs in a glabrous western phase and a glandular eastern phase. Dr. Pennell's map shows this clearly; the two phases intermingle in those two problem regions, the Ozarks and the Driftless Area. It is somewhat surprising, then, to see Dr. Fernald treat these two phases as forms rather than varieties. The present writer, perhaps because he received his botanical training from Professor Fernald, has held to the principle that intraspecific variations showing geographic segregation are best treated as varieties,

[1] Received May 19, 1947.
[2] Acad. Nat. Sci. Philadelphia Mon. 1: 365. 1935.
[3] Med. Fl. 2: 110. 1830; emended in Atl. Journ. 1: 150. 1832, and New Fl. N. Am. 4: 37. 1838.
[4] Rhodora 23: 37. 1921.
[5] Rhodora 41: 566–568. 1939.
[6] Enum. Pl. Transsyl. 492. 1866.

and those of sporadic occurrence as forms. The glabrous *Ranunculus abortivus* is predominently southern, the pilose var. *acrolasius* is northern.[7] Typical *Sphenopholis obtusata*, with leaves glabrous or scabrous, is irregularly dispersed over the eastern half of the United States, but is largely replaced by the pilose-leaved var. *pubescens* on the Coastal Plain and outer Piedmont.[8] On the other hand, *Alnus rugosa* var. *typica*, with essentially glabrous leaves, ranges from Nova Scotia to Michigan, south to New England, Pennsylvania, and Indiana; forma *emersoniana*, with leaves permanently pilose-tomentulose on the lower surface, is "of essentially the same range but forming individual and constant large colonies."[9] *Veronica connata* and its var. *glaberrima* seem much more comparable to the examples cited as varieties than to that treated as a form.

Conclusion: the name *Veronica connata* Raf. is probably valid for the species described by Pennell as *V. catenata* and treated by Fernald as *V. salina* Schur; the eastern glandular phase and the western glabrous phase are better treated as geographic varieties than as forms.

[7] FERNALD, Rhodora **40**: 417–420. 1938.
[8] FERNALD, Rhodora **43**: 533. 1941.
[9] FERNALD, Rhodora **47**: 345–350. 1945.

ENTOMOLOGY.—*Revision of the genus* Nysius *in the United States and Canada* (*Hemiptera Heteroptera: Lygaeidae*).[1]

H. G. BARBER, Roselle, N. J. (Communicated by P. W. OMAN.)

The genus *Nysius*[2] was described by Dallas in 1852 with 11 included species. Since that time several of these species have been transferred to other genera, but so many have been added that it has become a very large aggregation. Because of their general similarity and the wide dispersal of certain species considerable synonymy has resulted in the literature.

Stål, 1874, Horvath, 1890, Baker, 1906, and Usinger, 1942, have published complete or partial revisions of the genus; however, only that of Baker is restricted to the western world. Horvath's synopsis indicated some important characters, in addition to those mentioned by Stål for distinguishing the Palearctic species. In consequence, while the European species have been clearly recognized, some confusion has existed with reference to the application of certain specific names for forms occurring in the United States.

Both Uhler and Baker contributed to this confusion by failure to recognize the true identity of several previously described species. Whatever may have been his earlier views Uhler, in his *Check list of Hemiptera Heteroptera of North America*, 1886, apparently expressed his latest ideas in regard to the valid specific names. He erroneously cited *ericae* Schilling as a synonym of *thymi* Wolff and listed both *raphanus* Howard and *destructor* Riley as synonyms of his *angustatus*. In his *Observations upon heteropterous Hemiptera of Lower California*, 1894, he redescribed William Howard's *raphanus* as *strigosus* and a year later in the *Preliminary list of the Hemiptera of Colorado*, 1895, he again described the same species as *minutus*. The synonymy of this species should be stated as follows: *N. raphanus* Howard, 1862 = *destructor* Riley, 1863 = *strigosus* Uhler, 1894 = *minutus* Uhler, 1895.

Baker, in his *Notes on the Nysius and Ortholomus of America*, 1906, made several glaring errors through failure to recognize the identity of the Uhler species and through omission of any mention of either *raphanus* or *ericae*. His *angustatus* is evidently a mixed species, containing both Uhler's true *angustatus* and *ericae*. Having failed to recognize Uhler's species he redescribed it as *coloradensis*. Also mistaking the nature of Uhler's *strigosus* he synony-

[1] Received May 6, 1947.
[2] It has been demonstrated by W. E. CHINA, *The generic names of British insects*, p. 243, 1943, and also by R. L. USINGER and R. I. SAILER, Proc. Ent. Soc. Washington **46**: 260, 1944, that this generic name will have to be changed unless conserved by action of the International Commission on Zoological Nomenclature.

mized it with the European *senecionis* (Schilling). The *strigosus* of Baker, not being the species Uhler described from Lower California, must be given a new name.

Baker described a number of varieties, two of which can be validated either as distinct species or subspecies: *coloradensis grandis* seems to be specifically distinct; *californicus alabamensis* is a good geographical race or subspecies, as it is confined to a definite area in the Eastern States. However, *californicus* var. *providus* (not Uhler) is *basalis* Dallas (*inaequalis* Uhler), and *angustatus* var. *niger* is merely a dark form of *ericae* scarcely worthy of subspecific status.

The foregoing conclusions in regard to synonymy in the genus are arrived at not only from study of the authors' written descriptions but are confirmed by authentically labeled specimens in both the Uhler and Baker collections now in the United States National Museum. A single male specimen from "Col.," labeled *Nysius angustatus* by Uhler, and another from "N. R. R." (Northern Railroad), were probably from the series which the author had before him when he drew up the original description written in 1872. Three carded specimens, a male and two females, are labeled "mistaken for the chinch bug, W. R. Howard," and although the specific name is not added there is no doubt that these represent his *raphanus*. Four carded specimens from "MO." bear the label "Type," written by C. V. Riley; although the name label has become detached there can be little doubt that this is his *destructor*. Riley admits, in his Fifth Missouri Report of 1875, that this is the same species described earlier by Wm. Howard as *raphanus*, who upon request agreed to suppress his name in favor of that of Riley's. A specimen from "Cheyenne, June '69," and another "Colo." both from the Baker collection and labeled *N. minutus* in Uhler's well-known writing, prove to be the same as *raphanus*. Dr. R. L. Usinger some time ago informed me that the type (No. 543) of *strigosus* Uhler, 1894, from Lower California, contained in the collection of the California Academy of Sciences, is the same species which Uhler later described as *minutus*. He kindly sent the cotype for confirmation. Other cotypes from the same series in the Uhler collection likewise confirm this synonymy. Thus, if it is conceded that *minutus* and *strigosus* are the same species and both synonymous with *raphanus*, it leaves *strigosus* of Baker, Horvath, Van Duzee, and others without a name. It should be mentioned here that some changes in synonymy are necessary in the Van Duzee Catalogue in order to conform to the foregoing opinions.

Another specific name of Uhler's will have to be placed in synonymy, as W. E. China, of the British Museum, has informed me by letter that *inaequalis* Uhler, 1894, from Grenada, West Indies, is the same as *basalis* Dallas, 1852, from Jamaica.

R. L. Usinger, who has examined the collection of *Nysius* deposited by Baker at Pomona College and has sent to me his notes on it, informs me that Baker attached red labels to certain specimens of his species, as follows: *californicus alabamensis*, *coloradensis*, and *grandis*. It was evidently his intention to consider these particular specimens as types of his species, but unfortunately this information remained unpublished and the specimens have no more than cotype value. It seems fitting to select these red-labeled specimens as lectotypes, as it was at Pomona College that Baker carried on his investigations in preparation for his *Notes on the Nysius and Ortholomus of America*. Many cotypes were also deposited in the United States National Museum which are noted later in the body of this article.

The writer received much information concerning the more important characters to be used in differentiating the species of *Nysius* from the very excellent treatment of the genus by R. L. Usinger, *The genus Nysius and its allies in the Hawaiian Islands* (Bernice P. Bishop Mus. Bull. 173, 167 pp., 1942).

Certain of the species are so closely related that use must frequently be made of relative rather than positive characters. Relative dimensions of body parts are utilized to a considerable extent. All such measurements were made with the small Zeiss binocular microscope, using the No. 4 ocular and Aa objective. Body propor-

tions are expressed in units equal to 0.0222 mm each.

Both in the discussion of the respective species and in the key only male specimens are referred to.

Thanks are due to Drs. E. A. Chapin and R. I. Sailer for the loan of many specimens from the U. S. National Museum collection, and again to the latter for much detailed information concerning the fixation of types for certain species; to W. E. China, of the British Museum, for comparison of specimens and for valuable information; and to Dr. R. L. Usinger, of the University of California, for reviewing this manuscript and for many helpful suggestions which have added to its value. The writer is indebted to Dr. G. Stuart Walley, Dominion Agricultural Department, Ottawa; to George A. Moore, of Montreal; and to J. F. Brimley, of Wellington, Ontario, for sending many specimens from various parts of Canada.

Nysius californicus Stål

Nysius californicus Stål, 1860, Freg. Eugenies Resa, p. 242; 1874, Enum. Hem. 4, p. 120.—Baker, 1906, Invert. Pacif. 1, pp. 134, 135.—Van Duzee, 1917, Cat. Hem. N. Amer., p. 158.—Usinger, 1941, Brooklyn Ent. Soc. Bull. 36, p. 131.

Nysius major Berg, 1878, Anal. Soc. Cient. Argentina, p. 225; 1879, Hem. Argen., p. 101. (New synonymy.)

Nysius californicus is the largest species of the genus occurring in the United States, 5.50–7 mm long, reaching its maximum size in California and decreasing in size in its more easterly range through Texas, Kansas, Nebraska, and Missouri. It may be distinguished from all the other species except *basalis* by the much shorter bucculae which scarcely extend behind middle of the gular region of head. The costal margin of corium is distinctly contracted for a short distance at base, not more than a third the length of scutellum, thence very nearly straight to apex of corium. Length of head is very nearly equal to that of the pronotum. Lengths of the antennal segments are as follows: 0.4050, 0.7875, 0.6750, and 0.7875 mm, respectively. Genital segment of male is black, broadly margined with pale yellow.

Distribution: Western Canada and the entire western United States, Mexico, Central America, and South America south to Argentina.

Nysius californicus alabamensis Baker

Nysius californicus alabamensis Baker, 1906, Invert. Pacif. 1, pp. 135, 137.—Van Duzee, 1917, Cat. Hem. N. Amer., p. 158.

This evidently should be maintained as a subspecies occupying a rather definite region in the eastern United States. Having an average body length of 4.75 mm (male), it averages smaller than the typical subspecies and also shows a somewhat darker shade of cinereous.

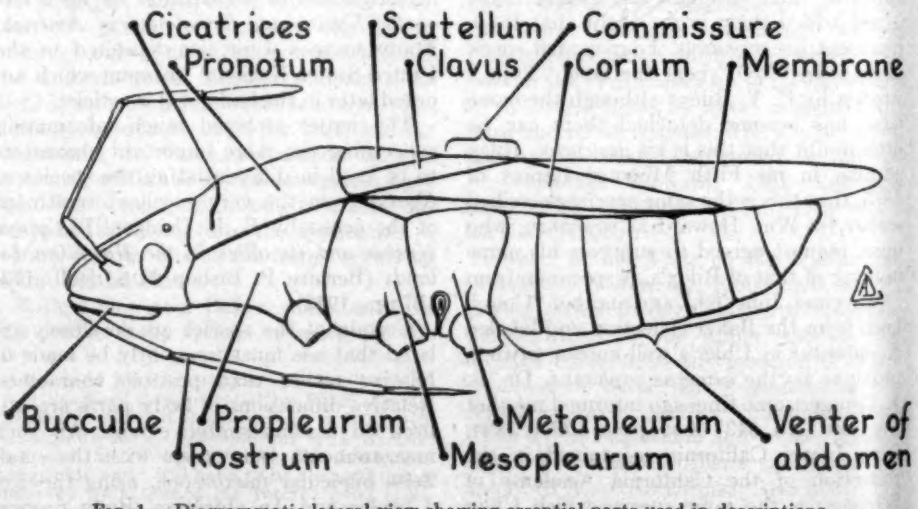

FIG. 1.—Diagrammatic lateral view showing essential parts used in descriptions.

The antennae are considerably shorter; the respective lengths of the segments are as follows: 0.315, 0.5625, 0.5175, and 0.675 mm.

Lectotype female: Auburn, Ala., VII-10-96 (C. F. Baker No. 2298), in the collection at Pomona College. Cotypes: Auburn, Ala., V-5-97 (C. F. Baker No. 2267), and Opelousas, La., IV-97 (C. F. Baker No. 2265), in the United States National Museum.

Distribution: From Ontario, Canada, on the north, through the New England States and eastern half of the United States to Florida and the Gulf States.

Dr. Harold Morrison collected this form in the Dominican Republic in 1917, and Dr. S. C. Bruner has a single specimen collected by J. Acuña in the province of Oriente, Cuba.

Nysius basalis Dallas

Nysius basalis Dallas, 1852, List Hem. Brit. Mus. **1**, p. 553.—Barber, 1923, Amer. Mus. Nov. **75**, p. 12.—Blatchley, 1926, Heter. East. N. Amer., pp. 351, 352.
Nysius (?) *ementitus* Distant, 1893, Biol. Centr.-Amer., Rhynch., **1**, Suppl., p. 385, tab. 34, fig. 9.
Nysius inaequalis Uhler, 1894, Proc. Zool. Soc. London, p. 183.—Van Duzee, 1917, Cat. Hem. N. Amer., p. 158 (exclude Baker).—Barber, 1939, Sci. Surv. Porto Rico **14**, pp. 340, 341.
Nysius californicus providus, Baker[1] (not Uhler), 1906, Invert. Pacif. **1**, p. 137.

Nysius basalis is about the size of *alabamensis* Baker. The color yellow-testaceous rather than cinereous, with the fuscous markings less evident, often more or less effaced. It agrees with *californicus* in having short bucculae, but the costal margin of the corium is scarcely if at all contracted at base and the entire outer costal margin is gently arcuate rather than straight. Posterior disk of the pronotum with a distinct, short, smooth, longitudinal callosity on either side of middle. Pronotal cicatrices are either concolorous or frequently reduced to four short fuscous marks. Most frequently in the darker forms a narrow, smooth, pale line extends from the middle of the vertex of head through the middle of the pronotum and scutellum. Veins of the corium sometimes only faintly spotted. The membrane is clear, transparent, occasionally with a faint, fuscous, apical streak. Genital segment of the male is either entirely pale yellow or sometimes with a slight fuscous area at base. Antennae are either entirely pale or the basal and terminal segments, as well as the bases of the second and third, lightly infuscated. Length, male, 4.70 mm.

Distribution: Dallas described this species from Jamaica and Brazil. Uhler described the same species as *inaequalis* from Grenada, West Indies, nine cotypes of which are in the collection of the United States National Museum; the type series is in the British Museum. Other specimens have been examined from the following localities: Jamaica, Dominican Republic, Haiti, Puerto Rico, St. Thomas, Cuba, Antigua, Guadeloupe, all in the West Indies; Mexico, Costa Rica, Honduras, Guatemala, Colombia, Trinidad, and northern Brazil. In the United States this species, from the evidence at hand, is restricted to Florida and the Gulf States.

W. E. China, of the British Museum, has kindly sent me a paratype of Distant's *ementitus* from Guatemala, labeled B. C. A., Cerro Zunil, 4000–5000 feet (Champion). A comparison of this with a cotype of *inaequalis* from Grenada shows that the names are synonymous.

In addition to the synonymy indicated above there is the possibility that *N. callifer* Stål from Colombia may have to be added to the list.

Nysius adjunctor, n. sp.

Color darkened cinereous, marked with fuscous as follows: Head broadly on either side of a narrow, pale, longitudinal, median fascia, cicatrices and punctures of the pronotum, scutellum, except the extreme apex, apices of the clavi, rather obscure maculae on the veins and along the posterior margin of the corium, spots on the femora and the bases of the tibiae.

Head nearly one-fifth wider than long (42:34); bucculae short, scarcely exceeding anterior margins of eyes. Antennae 1.86 mm long; second segment nearly one-third longer than basal, second and fourth subequal, each a fifth longer than third segment. Pronotum about one-third wider than long; cicatrices wide, conspicuous, connected in the middle; dorsum coarsely punctate. Scutellum nearly one-fourth wider than long (32:25), coarsely punctate at base and along the sides. Corium coated with fine, inclined hairs; basal costal

[1] In my copy of Baker's reprint the author has written, "The specific names *providus* and *inaequalis* should be interchanged wherever they occur."

margin not noticeably contracted but densely pilose; the outer margin gently rounded from base to apex. Membrane well extended beyond apex of the abdomen, hyaline, faintly smudged with fuscous along the middle; that portion which is beyond the apices of the coria is distinctly longer than the basal portion. Length, male 4, female 5 mm.

Type male: Chisos Mountains, Texas, VII-17-46 (collected by D. J. and J. N. Knull). Paratype female: Same data as type. Both in the collection of the Department of Zoology and Entomology, Ohio State University. Paratypes male and female: Guadalajara, Jalisco, Mexico, September 1903 (writer's collection).

This species with the short bucculae is rather closely related to *basalis*. I have been informed by Mr. China, of the British Museum, that W. L. Distant had this particular species mixed with his series of *ementitus* which I have made a synonym of *basalis*. Besides a difference in coloration it is somewhat smaller and narrower than *basalis*, with little evidence of longitudinal callouses on the disk of the pronotum.

Nysius angustatus Uhler

Nysius angustatus Uhler, 1872, 5th Ann. Rep. Geol. Surv. Terr. for 1871 (Hayden's Survey), p. 406; 1886, Check List Hem. Het., p. 13 (exclude synonyms).

Nysius coloradensis Baker, 1906, Invert. Pacif. 1, p. 136.

Nysius ericae Van Duzee, 1917, Cat. Hem. N. Amer., p. 159 (part).—Blatchley, 1926, Heter. East. N. Amer., p. 353 (part).

Color cinereous, marked with fuscous much as in *ericae*. The following parts more or less strongly marked with fuscous: Ocellar region of the head, pronotal cicatrices, scutellum along the middle region, spots on veins of the corium and also two conspicuous fascia on the posterior margin. Genital segment of male black narrowly margined with pale yellow. Membrane clear with ill-defined faint markings on the disk. Antennae testaceous, with the basal and apices of the second and terminal segments darker.

Head about one-fourth wider than long (45:32), lightly convex transversely. Antennae 2.03 mm long; basal segment somewhat incrassate, extended beyond apex of head by about one-fourth of its length; second segment about twice as long as basal; third segment one-fourth shorter than second and terminal subequal to second. Bucculae strongly elevated, gradually narrowing to end abruptly at base of head. Basal segment of rostrum not quite attaining apices of the bucculae. Pronotum about as long as the head (32:32), much wider than long (45:32); lateral margins lightly concave; cicatrices sharply defined, narrowly black. Scutellum about one-fifth wider than long (28:20). Costal margin of corium contracted at base for a distance equal to about two-thirds the length of the scutellum thence distinctly expanded and gently rounded to apex. Length, male, 4.25–4.50 mm.

Lectotype male: "Col.," labeled *Nysius angustatus* by Uhler. Cotype: "N. R. R." (Northern Railroad). Both from the Uhler collection in the United States National Museum.

Distribution: Across entire Dominion of Canada from Quebec to British Colombia; northern United States from Maine to Oregon and Washington. Not yet seen from California, but it should occur in the northern part of that state. Its southern limits seem to be in northern Kansas.

Lectotype of *coloradensis* Baker, female: Foothills, 5 miles west of Fort Collins, Colo., VIII-4-95 (C. F. Baker No. 1593), in the Baker collection at Pomona College.

Cotypes, males and females: Foothills west of Fort Collins, Colo., VIII-11-96 (no. 887); Steamboat Springs, Colo. VII (1329); foothills west of Fort Collins, Colo., VII (1370, 1371) and VII-10-96 (2325); Fort Collins, Colo., V-16-95 (1524); VI-13-95 (1563); VIII-20-95 (1604); VIII-8-96 (2632); VIII-27-96 (2084); VI-16-96 (2170); Camptons, Colo., VII-21-95 (1580); Morris Ranch, Laramie County, Colo., VII-11-96 (2009); mouth of Big South, Laramie County, Colo., VII-12-96 (2011); Grizzly Creek, Laramie County, Colo., VII-19-96 (2012); Forresters, Laramie County, Colo., VIII-3-96 (2013, 2020); Rabbit Ears Pass, VII-2-96 (2019); Spicers, North Park, Colo., VII-18-96 (2024); Chambers Lake, Colo., VIII-1-96 (2033) and VII-13-96 (2253); Cameron Pass, Colo., VII-31-96 (2037) and VII-30-96 (2150); Hardys Ranch, North Park, Colo., I-29-96 (2061); Elkhart, Ind., VIII-29-96 (2087); Toronto, Canada, IX-30-96 (2038) and V-25-96 (2142). All cotypes in the collection of the United States National Museum.

Two of Baker's cotypes of *coloradensis* are from Toronto, Canada, showing that he recog-

nized these as the same as his Colorado form, from whence most of his material came. The writer has received many specimens of *angustatus* Uhler (= *coloradensis* Baker) from Quebec, Ontario, Saskatchewan, Manitoba, Alberta, and British Columbia in Canada. It has often been confused with both *ericae* and *thymi*.

Nysius grandis Baker

Nysius coloradensis grandis Baker, 1906, Invert. Pacif. 1, p. 136.—Van Duzee, 1917, Cat. Hem. N. Amer., p. 160.

Although closely related to *angustatus* differences in coloration as well as in relative size and shape of parts indicate that *grandis* should be given specific rank. In this species the differences are for the most part relative rather than positive.

Color darker than *angustatus*, often rusty fuliginous, the fuscous markings more conspicuous. Other noticeable differences are: Fuscous cicatrices of the pronotum are broader, more conspicuous and less sharply defined; pronotum posteriorly more coarsely punctate; scutellum black, devoid of a pale area on either side of the middle; veins of corium and the posterior margin more heavily splotched with fuscous; membrane less clear, faintly tinged with brown and the fuscous spots more evident; femora more profusely spotted.

Compared to *angustatus* the head is wider (50:35), the vertex flatter, the eyes appearing a little larger; the bucculae are similar, but the basal segment of the rostrum usually extends to the apices of the bucculae; the antennae are definitely longer; the pronotum is flatter and not so noticeably depressed anteriorly, also appearing more quadrate (38:38:60); the costal margin is a little more flaring posteriorly. Length, male, 4.80–5.00 mm.

Lectotype male: Rabbit Ears Pass, Colo., VIII-4-95 (Baker No. 2019), in the Baker collection at Pomona College. Cotypes, males and females: Chambers Lake, Colo., VII-18-95 (No. 1582) and VIII-1-96 (2033); Fort Collins, Colo. (1733); Morris Ranch, Laramie County, Colo., VII-11-96 (2009); mouth of Big South, Laramie County, Colo., VII-12-96 (2011); Rabbit Ears Pass, Colo., VII-21-96 (2019) and VII-20-96 (2270); Four Mile Hill near Steamboat Springs, Colo., VII-21-96 (2030); 5 miles west Cameron Pass., Colo., VII-29-96 (2041). All cotypes are in the Baker collection at the United States National Museum.

Distribution: Because of lack of sufficient evidence the exact limits of the range are uncertain. So far as the writer's records go this species is confined to the higher altitudes with an extended range from Churchill, Manitoba, on the north to Arizona in the United States and through Mexico to Panama. A single female specimen from the Biologia Centrali-Americana material in the United States National Museum is labeled Volcán de Chiriquí (Panama), 4,000 to 6,000 feet.

Nysius thymi (Wolff)

Lygaeus thymi Wolff, 1804, Icon. Cim. 4, p. 149, tab. 15, fig. 142; 1804, Abbig. Wanz. 4, p. 147, tab. 15, fig. 143.

Nysius thymi Horvath, 1890, Rev. d'Ent. 9: p. 188.—Van Duzee, 1917, Cat. Hem. N. Amer. (part).

Nysius angustatus, *grandis*, and *thymi* constitute a group of closely related species resembling each other superficially and not always easy to separate through reference to structure alone. As expressed elsewhere distinctions are often more relative than positive.

In general, *thymi* will average smaller than *angustatus* and is darker, being more rusty cinereous in color. The preocular part of the head is only slightly longer than an eye (16:14), while in *angustatus* this is about 17:13; the antennae are equal in length to those of *angustatus* but definitely shorter than in *grandis;* the bucculae are distinctive, being rather high anteriorly and narrowing posteriorly to end a little before base of head, not at base as in *angustatus*. Scutellum, except at extreme apex, black. Although somewhat variable the contracted basal part of the costal margin is usually a little longer in relation to the length of scutellum. Membrane faintly infumed with brown, splotched along the middle with fuscous. Length 3.60–4.00 mm.

Distribution: As a very limited number of specimens of this species have been seen by the author, the delimitation of its range in North America will have to wait for more evidence. Specimens are at hand from Wanakena, Cranberry Lake (C. J. Drake), and from near Sabael, Indian Lake, in the Adirondack Mountains, Keene Valley in Essex County, and Mountain View in Franklin County, all in New York State. Through Dr. G. Stuart Walley, of Ottawa, specimens have been received from Thunder River and Natashquan in Quebec, Canada, near the mouth of the St.

Lawrence River. Anse au Griffon, Quebec (J. M. Aldrich).

N. thymi is a Palearctic species occurring across northern Europe and Siberia. From the evidence at hand it reached the North American continent by way of the northeast rather than the northwest from Siberia.

Nysius ericae (Schilling)

Heterogaster ericae Schilling, 1829, Beitr. Ent. **1**, p. 86, pl. 7, fig. 10.
Nysius thymi, Uhler, 1886, Check List Hem. Het., p. 13 (part).
Nysius ericae, Horvath, 1890, Rev. d'Ent. **9**, p. 186.—Van Duzee, 1917, Cat. Hem. N. Amer., p. 159 (part).—Blatchley, 1926, Heter. East. N. Amer., p. 351, 353, fig. 14 (excl. syns.).
Nysius angustatus, Baker (not Uhler), 1906, Invert. Pacif. **1**, p. 135 (part).
Nysius angustatus niger Baker, 1906, Invert. Pacif. **1**, pp. 135, 136. (New synonymy.)

Color cinereous. Punctations and fuscous markings similar to *angustatus*, the punctures on the pronotum often arranged in five irregular, longitudinal series; scutellum except extreme apex, black, occasionally with a vague, pale spot on either side of middle; corium having fine, appressed pubescence, nearly devoid of erect hairs; veins very lightly spotted; membrane clear, very faintly if at all spotted. Genital segment of the male entirely black or more rarely with a very narrow pale margin.

Head about one-third wider than long (42:26); eyes less projecting than in *angustatus*. Antenna with the short basal segment scarcely exceeding apex of head; second segment about twice as long as basal, third a little shorter than second and the terminal either subequal to or a little longer than the third segment (12:25:20:25). Bucculae less elevated than in *angustatus*, gradually narrowing in height to terminate at a point before base of head. Pronotum nearly one-third wider than long (50:30), subequal to or a little longer than head; across posterior margin one-fifth wider than head across eyes. Scutellum much wider than long (33:23). Corium rather opaque. Costal margin contracted at base for a distance equal to two-thirds the length of scutellum, thence very little expanded and gently rounded to apex. Costal margin at base sparsely pilose; the general surface usually devoid of erect hairs. Membrane only slightly surpassing apex of abdomen in the male, more extended in the female, but less so in both sexes than in *raphanus*. Basal part of membrane between commissure and apices of coria subequal to the apical part behind apices of coria.

Distribution: *N. ericae* is a Holarctic species with a very wide range in Europe, northern Africa and parts at least of central Asia. In North America it occurs in the entire Dominion of Canada from New Brunswick to British Columbia and in the United States across all the northern States from Maine to Washington, Oregon, and northern California. In the region of Kansas it overlaps the range of *raphanus* which replaces the above species through the southern states.

As stated above in the synonymy of the species it has been much confused with *angustatus*. It differs from *angustatus*, besides being smaller, in having less elevated bucculae which do not terminate so abruptly but taper off to end at a point before base of head. It is more closely related to *raphanus;* however, the latter has a shorter pronotum and longer hemelytra, with the membrane more extended beyond the end of the abdomen. Length, male, 3.25–3.70 mm.

It should be recorded here that the lectotype of *angustatus niger* Baker, a synonym of *ericae*, is a female labeled "Wash. No. 2508" in the Baker collection at Pomona College. Four cotype females, with the same data, are in the Baker collection in the United States National Museum.

Nysius raphanus Howard

Nysius raphanus Howard, 1872, Southern Farmer **6**, p. 273; 1872, Can. Ent. **4**, p. 219.
Nysius destructor Riley, 1873, 5th Rep. Insects Missouri, p. 113.
Nysius strigosus Uhler, 1894, Proc. California Acad. Sci. (2) **4**, p. 238. (New synonymy.)
Nysius minutus Uhler, 1895, Hem. Colorado, p. 22.—Van Duzee, 1917, Cat. Hem. N. Amer., p. 160. (New synonymy.)
Nysius angustatus minutus, Baker, 1906, Invert. Pacif. **1**, p. 137 (listed).
Nysius ericae, Milliken (not Schilling), 1918, Journ. Agr. Res. **13**, pp. 571–578, pls. 60, 61.

Coloration and facies resemble *ericae* very closely. Head is about one-third wider than long (30:20). The antennae are shorter than in *ericae*, basal segment barely exceeds apex of head, lengths of the segments are 10:22:18:26. Bucculae lightly elevated, gradually narrowing posteriorly to end in a point before base of head, much as in *ericae* but not so abruptly terminating as in *angustatus*. Pronotum is

noticeably short, often nearly twice as wide as long, in the male (45:23), little longer than head. Scutellum, except at extreme apex, is usually black, much wider than long (23:15). Costal margins of coria are very nearly straight in the male and parallel to each other, less expanded, even in the female, than in *ericae*. Membrane clear, appearing longer than in *ericae* as it extends farther beyond the tip of the abdomen. The apical part of the membrane is distinctly longer from the apices of the coria than the basal part of membrane before these. Genital segment of male usually entirely black. Smaller than *ericae*, 3.10–4.00 long.

Lectotype male: From Wm. Howard's set of three (carded), labeled "mistaken for the chinch bug." United States National Museum.

Lectotype *destructor* Riley: Male from C. V. Riley's set of four (carded), labeled "Type," United States National Museum.

Lectotype *minutus* Uhler: Male, "Colo. No. 1684," labeled *Nysius minutus* by Uhler, United States National Museum.

Type and cotypes of *strigosus* Uhler are in the collection of the California Academy of Sciences. Cotypes in the United States National Museum.

Distribution: Throughout all the southern states from Virginia south to Florida, and west across the United States to southern California, with some extension into Mexico. In its northern limits it overlaps the more northern *ericae*.

Through a misidentification Uhler labeled a specimen from Cheyenne, Wyo., June 1869, as *angustatus* Uhler. This specimen was erroneously selected as the type of that species under catalogue No. 693 in the United States National Museum. Since no Wyoming locality is mentioned in the original description it is clear that the specimen is not part of the cotype series of *angustatus*.

Nysius monticola Distant

Nysius (?) *monticola* Distant, 1893, Biol. Centr.-Amer., Rhynch. 1, Suppl., p. 385, tab. 36, fig. 8.

Color dark cinereous, with ground color of head and pronotum brownish red, heavily marked with fuscous on either side of head, and anteriorly on the pronotum. Corium opaque, the surface having a dense coating of short, appressed silvery hairs, interspersed with some scattered longer, erect hairs, the costal margin of corium appearing clearer in contrast; veins much spotted with fuscous. Scutellum, except at extreme apex, black. Ventral segments of abdomen of male as well as the genital segment, black, with slight indications of testaceous maculations. Membrane spotted with fuscous.

Head one-fourth wider than long. Pronotum two-fifths wider than long and subequal to length of the head. Scutellum one-third wider than long. Antennae with second segment twice as long as basal, second and fourth segments subequal. Contracted basal part of corium equal to length of the scutellum. Basal part of membrane from apex of commissure to apices of coria is but little shorter than the apical part of membrane behind these apices. Length, male, 3.80 mm.

More closely related to *ericae* than to other species of *Nysius* but is much darker and more pubescent than that species.

A specimen from Bright Angel Camp, Ariz., elevation 6,900 feet, collected by Wickham, was sent to W. E. China, of the British Museum, for comparison with the type. He writes that while this specimen strongly resembles Distant's type the relation of the width of the head to its length does not agree. I have since made measurements of a number of Mexican and Arizona specimens and find that the range of variability in this respect is considerable.

Distribution: Guatemala (Distant): Temescaltepec and Cuajimalpa, Mexico (R. L. Usinger); Chiricahua Mountains, Peach Springs, and Springerville, Ariz.; Beulah, N. Mex.; Brewster County, Tex., in the collection of the California Academy of Sciences; Huachuca Mountains, Ariz.; Palmer Lake and Trinidad, Colo. (writer's collection); specimens from Arizona and Colorado in the collection of the United States National Museum.

Nysius tenellus, n. sp.

Nysius senecionis, Baker, 1906, Invert. Pacif. 1, pp. 135, 136, 137 (not Schilling).

Nysius strigosus, Horvath (not Uhler), 1908, Ann. Mus. Nat. Hungarici 6, p. 558.—Van Duzee, 1917, Cat. Hem. N. Amer., p. 160.—Barber, 1939, Sci. Surv. Porto Rico 6, pp. 340, 342.

Typical pale form: Color pale yellow testaceous; punctations for the most part concolorous. The following parts fuscous: Head on each side with an abbreviated fascia extending anteriorly from base of head to a short distance before the ocelli, cicatrices of pronotum, depressed base of the scutellum, four rather inconspicuous spots on the posterior margin of

corium; ventrally with an irregular spot on both the pro- and mesopleura, the meso- and metasternum, and the basal half of the venter. Legs vaguely, if at all, spotted.

Head much wider than long (35:25); eyes less projecting than in *ericae*. Bucculae rather strongly elevated throughout, the lower edges very nearly straight, ending abruptly at base of head. Antennae about as long as head, pronotum, and scutellum united, basal segment short, scarcely surpassing apex of head; second segment twice as long as basal, third somewhat shorter than second and terminal subequal to the second segment (10:23:20:23). Pronotum finely, closely punctate, nearly one-third wider than long (46:30), a little longer than the head and about one-third wider across humeri than head across eyes (46:35), seen from the side distinctly depressed in the region of the cicatrices which are narrow and disconnected in the middle. Scutellum nearly one-third wider than long (28:20), apical carina distinctly elevated. Corium hyaline, glabrous; veins plainly elevated and immaculate; costal margins contracted at base and parallel to each other for a distance equal to the length of the scutellum thence slightly flaring and gently rounding to apices; contracted part devoid of fine pile or hairs. Membrane hyaline, immaculate. The basal part of the membrane from the apex of the commissure to apices of the coria is distinctly shorter than the apical part beyond the apices of coria. Length 3.60–4.00 mm.

Atypical dark form: In some parts of the range of the typical form there occurs a darker variety, possibly a seasonal form, in which the punctations and fuscous markings are very much more pronounced, causing it to resemble *ericae* very closely in general appearance. However this variety can very readily be distinguished from *ericae* by the same structural differences as shown in the typical form. Specimens of this dark variety have been seen from California, Washington, and Utah.

Distribution: In western North America it ranges from British Columbia south through all of the Rocky Mountain States and west to California. In the southern United States it occurs in western Texas, Arizona, New Mexico, and Florida, and south through Mexico and Central America. In the West Indies it is found at least in Haiti and Puerto Rico.

Type male and allotype: Santa Clara County, Calif., Baker (U. S. Nat. Mus.).

Paratypes, males and females: ARIZONA: 1, Chiricahua Mountains, VIII-10-07 (Webb); 1, Stone Cabin Canyon, Santa Rita Mountains, VIII-25-13 (Pierce), on pink *Sphaeralcea;* 9, Tucson, VIII-11-14 (Coad), on peach; 5, Tucson, V-6 (Hubbard); 5, Tucson, XII-20 (Hubbard); 37, Sabino Canyon, IV-23-40 (Oman); 5, Patagonia, VIII-23-37 (Andre); 20, Chiricahua Mountains, VI-9-33 (Oman); 3, Yarnell Heights, VI-29-33 (Oman); 4, Phoenix, V-27-38 (Christenson); 2, Mesa, IX-10-38 (Christenson); 1, Glendale, VIII-5-38 (Christenson); 1, Nogales, Santa Cruz County, IX-20-06 (Nunenmacher); 1, Tucson, 6-16-33 (Oman); 2, Tucson, V-27-1896 (Kunze); 4, Tucson, 4-30-1896 (Kunze); 9, Prescott, V-15-1896 (Kunze); 2, Tucson, V-27-1896 (Kunze); 1, Tucson, V-20-1896 (Kunze); 3, Arizona (Uhler collection); 8, Monte Vista, altitude 9,000 ft., Chiricahua Mountains, VII-10-19 (Whetmore); 6, Sasabe, X-17-37 (Oman); 10 Mount Lemmon, VIII-23-37 (Andre); 3, Williams, VIII-13-37 (Andre); 11, Oak Creek Canyon, VIII-6-38 (Christenson); 1, Flagstaff, V-31-35 (Oman); 2, Granite Dells, V-30-37 (Oman); 9, Yarnell Heights, V-31-35 (Oman); 1, Oak Creek Canyon, IV-8-40 (Christenson); 3, Congress Jct., VI-28-33 (Oman); 1, Tucson, VI-18-33 (Oman); 1, Fort Huachuca, VI-10-33 (Oman); 1, Tubac, VI-24-33 (Oman); 2, Tucson (Webb); 1, Santa Rita Mountains, IV-25-40 (Oman; 1, Santa Cruz River near Tubac, X-23-37 (Oman); 3, Williams, VII-24-05 (Barber & Schwarz); 1, Williams, V-27-05 (Barber & Schwarz); 1, Williams, VII-1-05 (Barber & Schwarz); 1, Williams, VI-3-05 (Barber & Schwarz); 1, Bright Angel, Colorado Canyon, V-5-05 (Barber); 1, Palo Verde, VI-11-19 (Whetmore); 1, Littlefield, II-15-32, *Chrysothamnus speciosus* (Davis); 1, Williams, VII-11-18 (Whetmore); 1, Mount Graham, V-3-14 (Holt).

MEXICO: 1, Mexico City, VI-21-1897 (Barrett); 1, Juárez, VII-3-1897 (Morse); 1, Sacramento, X-1896; 2, Mexico, intercepted at Brownsville, IV-22-36, on Shasta daisies; 2, Mexico, intercepted at Brownsville, IV-24-36, in lilies; 2 Mexico, intercepted at Brownsville, X-29-36, on chrysanthemums; 2, Mexico, intercepted at Brownsville, V-8-37, on Shasta daisy; 1, Mexico, intercepted at Brownsville, V-1-36, in lilies; 2, Mexico, intercepted at Laredo, Tex., II-18-34, on feverfew; 1, Mexico, intercepted at Brownsville, X-30-38, chrysan-

themums; 1, Mexico, intercepted at El Paso, Tex., XI-12-40, med. herbs; 2, Mexico, intercepted at El Paso, Tex., X-31-40, chrysanthemums; 2, Mexico, intercepted at Brownsville, III-25-40, Manzanilla; 1, Nogales, Sonora, intercepted at Nogales, Ariz., VI-5-41, cut flowers; 1, Nogales, Sonora, intercepted at Nogales, Ariz., VI-21-41, cut flowers; 1, Victoria, III-16-22 (Holloway & T. C. Barber); 2, Cuernavaca, Mor., II-1945 (Krauss), on flowers of *Eupatorium adenophorum;* Tamasopa, 1, VII-4-09 (Bishopp); 1, San José de Guaymas, IV-10 (L. O. Howard).

HONDURAS: 1, La Ceiba, IX-11-16 (Dyer).

HAITI: 5, Haiti (W. A. Hoffman).

PUERTO RICO: 2, Santurce, V-19-34, on *Pluchea purpurascens.*

All in the collection of the United States National Museum.

CALIFORNIA: 11, Taylorville, VIII-11-37; 22, Pasadena, II-20-28; Palo Alto, IV-30-28 (H. G. Barber); Inyo Mountains, VII-7/11 (Wickham); San Diego County, IV-7-13 (Van Duzee); San Antonio Canyon, Ontario, VII-27-07; Santa Clara County, V-1902. ARIZONA: Huachuca Mountains, VII-8/15-05 (H. G. Barber); Sabino Canyon, Santa Catalina Mountains (Knight); Phoenix, IX-25-02, and Prescott, VII-15-1898 (Palm). In the collection of the writer.

All the following additional material is in the collection of the National Museum:

UTAH: 1, Provo, X-22-38 (Christenson); 1, Logan Canyon, IV-21-41 (Knowlton & Nye); 1, Promontory, X-6-14 (Whetmore); 1, Provo, VIII-23-36 (Christenson); 1, Lehi, IX-1905 (Hooker); 1, Spanish Fork, VIII-21-38 (Hardy) 2, Moab, X-25-38 (Christenson); 1, American Fork Canyon, VI-23-1891; 2, Alta, 10,000 ft., VI-30-1891 (Uhler collection); 1, Willard, X-5 (Whetmore).

COLORADO: 1, Steamboat Springs, July (Baker); 1, Elk River, July (Baker).

WASHINGTON: 1, Wenatchee Mountains, VII-9-30 (Rolfs); 1, Mount Rainier, VII-17-37 (Benmion); 1, Yakima (Uhler collection); 7, Orville, X-9-40 (Christenson); 5, East Wenatchee, X-5-46 (Christenson); 2, Cheney, X-1-32 (Rodock), *B. tectorum;* 5, Clarkston, XI-23-32 (Rodock), rabbit brush *Chrysothamnus;* 4, Pullman, VII-23-08 (Mann); 1, Hunts Junction, IX-13-04 (Titus); 2, Pasco, IX-11-04 (Titus).

OREGON: 1, north of Bend, VII-2 (Oman); 1, Corvallis, VIII-8-31; 1, Echo, VII-15-04 (Titus); 11, Hood River, IX-21-07 (Morse).

IDAHO: 2, Twin Falls, VII-2-28, *Beta vulgaris;* 1, Blackfoot, VI-22-04 (Titus).

BRITISH COLUMBIA: 1, Kaslo, VII-16 (Caudell); 1, Vancouver Island (Uhler collection).

WESTERN TERRITORIES: 6 (Uhler collection).

CALIFORNIA: 6, Santa Cruz Mountains; 1, California (Uhler collection); 4, Taylorville, Marin County, VIII-11-37 (H. G. Barber); 4, Los Angeles County, July; 15, Calipatria, X-28-21 (Kalmbach); 3, Mojave, XI-11-14 (Whetmore); 1, Tulare County, VI-6-09 (Davidson), *Helianthus;* 1, Cajon, VIII-9-37 (Harris); 2, Spreckels, IX-20-04 (Titus), sugar beets; 1, Ontario (Osborn); 2, Claremont (Baker); 1, Holtville (Wildmuth); 2, Hemet, VIII-15-39 (Christenson), *Erigeron canadensis;* 7, Three Rivers, VI-9-35 (Oman); 3, Fieldbrook, V-29-03 (H. S. Barber); 1, Los Angeles, April (S. O. Howard); 1, Cajon Pass, V-6-35 (Oman); 3, near Tehachapi, VI-8-35 (Oman); 2, east of Jacumba, VI-1-35 (Oman); 6, Sequoia National Forest, Hospital Rock, VI-11-35 (Oman); 4, Tehachapi, VIII-2-1897 (Morse); 5, Los Angeles, VII-29-1897 (Morse): 5, Los Angeles, VII-21-1897 (Morse); 2, San Bernardino, VII-18-1897 (Morse); 1, Yosemite Valley, VIII-10-1897 (Morse); 1, Berkeley, VIII-20-1897 (Morse); 1, Lancaster, VII-31-1897 (Morse); 1, Baden, VIII-24-1897 (Morse); 9, Santa Clara County (Baker); 5, Garden Grove, XII-28; 1, Laguna Mountains, San Diego County, VIII-21-19 (Pierce), *Artemisia tridentata;* 2, Tamalpais, 2,500 ft., XI-15-1899 (L. O. Howard); 9, Yucaipa, VI-7-38 (Christenson); 2, Echo Lake, VII-23-33 (Zimmermann); 7, Banning, II-14-39 (Christenson); 1, Mather, VII-4-32 (Zimmermann); 1, head of Virginia Canyon, Yosemite Park, 10,000 ft., VIII-5-39, ex *Poa leibergii* (Usinger); 2, Salinas, VIII-26-42, (Lange), *Parthenium argentatum* Gray; 1, Scotia, V-5 (H. S. Barber).

NEVADA: 6, Ormsby County, July (Baker).

NEW MEXICO: 10, Mesilla Park, V-25-09 (Ainslie); 2, Organ, VI-8-33 (Oman); 1, Las Cruces, VII-1903 (Cockerell), on alfalfa; 1, Clouderoft, VI-7-33 (Oman).

TEXAS: 3, Bangs, X-17-39 (Christenson); 1, Brownsville, V-17-39, intercepted on feverfew; 1, Brewster County, Chisos Mountains, VI-10-08 (Mitchell & Cushman); 2, Brownsville, V-31-33 (Oman); 2, Sanderson, VI-5-33 (Oman); 2, Bexar County, XI-28-38 (Turner).

Nysius insoletus, n. sp.

Color pale yellow-testaceous with the following fuscous markings: A rather wide longitudinal fascia on each side of the head extending from the base to the apex of the antenniferous tubercles, a spot behind eyes, terminal segment of antenna, cicatrices of pronotum, lateral angles and median longitudinal fascia of the scutellum, very obscure spots on the veins and along the posterior margin of the corium; beneath, with the head vaguely on each side of the bucculae, a large median spot on the propleurum and a narrow longitudinal line above this, center of the mesopleurum, a narrow longitudinal line above the evaporating surface of the metapleurum and the meso- and metasternum, broad base of the venter in the male and frequently a lateral longitudinal fascia extending from the base to the genital segment; faint spots on the femora.

Head nearly one-third wider across eyes than long (57:38); eyes strongly protruding beyond the anterior angles of the pronotum; vertex two and three-fourths times wider than an eye (33:12); bucculae very greatly elevated throughout, ending abruptly at base of head, the lower edges straight. Antenna with the basal segment extending beyond apex of head by nearly one-half of its length, second segment just over twice as long as basal, third and fourth segments nearly equal in length, each about one-third shorter than second, relative lengths are as 20:44:30:32. Pronotum just over one and one-half times wider than long (68:40), coarsely punctate, much wider across humeri than head across eyes (68:57); lateral margins distinctly, concavely arcuated opposite the cicatrices which are clean-cut, disconnected in the middle and not quite reaching the lateral margins on each side. Scutellum nearly one-fourth wider than long (40:30), coarsely punctate, strongly depressed at base; apical carina distinct. Corium opaque; very sparsely covered with fine recurved hairs; veins strongly elevated; R+M distinctly forked before base of the membrane; costal margins contracted at base and there parallel to each other for a distance equal to the length of scutellum, thence strongly flaring and gently rounding to apices of the corium; this contracted part with a few fine hairs, frequently abraded. Membrane hyaline, extending but little beyond apex of abdomen, its outer margin a little less than half as long as the costal margin. Length 5.00–5.75 mm.

Type males: Plain City, Utah, VIII-5-03. Six paratypes, males and females, as follows: Four with the same data as the type; one, mouth Bear River, Utah, XI-30-14 (A. Wetmore); one, Chambers' Lake, Larimer County, Colo., VII-13-1896 (Baker). All in U.S.N.M.

Distribution: Only the specimens mentioned above have been seen. Its complete range will be made known by further collecting.

This species is most closely related to *angustatus* from which it can best be distinguished by difference in color, size, more elevated bucculae, longer antennae, and more distinctly elevated veins of the corium.

Nysius groenlandicus (Zetterstedt)

Lygaeus groenlandicus Zetterstedt, 1840, Ins. Lapon., p. 262.

Nysius groenlandicus, Stål, 1874, Enum. Hemip. 4, p. 121.—Van Duzee, 1917, Cat. Hem. N. Amer., p. 159.—Lindberg, 1935, Skrifter om Svalbard og Ishavet No. 65, pp. 11–17 (synonymy, life history, distribution, etc.)

Nysius ericae obscuratus Horvath, 1890, Rev. d'Ent. 9: p. 188 (*teste* Lindberg, 1935).

General color cinereous, in part heavily marked with fuscous as follows: Head, broadly, on either side of the middle testaceous portion, cicatrices broadly, and punctures of pronotum, the scutellum, corium with outer edge, veins, and posterior margin, conspicuously, venter of abdomen except for a few vague testaceous spots posteriorly, and spots on the femora which often merge to form a uniform color.

Head about one-third wider than long; bucculae, as in *ericae*, higher in front, gradually tapering posteriorly, ending at a point just a little before base of head. Antennae with second segment twice as long and the third nearly one-third longer than basal, terminal subequal to second segment. Pronotum nearly one-third and the scutellum about one-fifth wider than long. Corium contracted at base for a distance equal to two-thirds the length of scutellum, contracted part densely pilose; surface densely coated with fine, appressed hairs, usually devoid of longer erect hairs; maculae of veins often merge to form continuous lines. Membrane clear, faintly marked with fuscous along middle of disk: basal part from apex of commissure to apices of coria shorter than remainder of membrane beyond coria. Length, male, 4.10; female, 4.30–4.50 mm.

It is rather surprising that Lindberg followed Zetterstedt in relating this species to *thymi* rather than to *ericae* inasmuch as Horvath in 1890 recognized it as related to *ericae*. Horvath erected in *ericae* the variety *obscuratus* which Lindberg has cited as a synonym of *groenlandicus*. In fact, it is very closely related to *ericae*, having the general facies of larger, more pilose, darker specimens of that species.

Lindberg gives the distribution of *groenlandicus* as: Greenland, Hudson Bay Territory, Labrador (from Van Duzee), northern Norway, northern Sweden, northern Finland, northern Russia, Siberia, northern China, Turkestan, and northern India.

Recently received specimens from Dr. G. S. Walley, of Ottawa, extend the range of this species in Canada as follows: Churchill, Manitoba; Bradore Bay at the extreme eastern end of Quebec; and Prince Edward Island in the Gulf of St. Lawrence.

LIST OF SPECIES OF NYSIUS WITH SYNONYMY

1. *californicus* Stål, 1860
   major Berg, 1878
2. *californicus alabamensis* Baker, 1906
3. *basalis* Dallas, 1852
   ?callifer Stål, 1874
   ementitus Distant, 1893
   inaequalis Uhler, 1894
   californicus providus Baker, 1906 (not Uhler)
4. *adjunctor*, n. sp.
5. *angustatus* Uhler, 1877
   coloradensis Baker, 1906
6. *grandis* Baker, 1906
7. *thymi* (Wolff, 1804)
8. *ericae* (Schilling), 1829
   niger Baker, 1906
   angustatus of authors (not Uhler)
9. *raphanus* Howard, 1872
   destructor Riley, 1873
   strigosus Uhler, 1894
   minutus Uhler, 1895
10. *monticola* Distant, 1893
11. *tenellus*, n. sp.
    strigosus of authors (not Uhler)
    senecionis Baker (not Schilling)
12. *insoletus*, n. sp.
13. *groenlandicus* (Zetterstedt, 1840)
    ericae obscuratus Horvath, 1890

KEY TO SPECIES (MALES)

1. Bucculae very short, not extended beyond middle of gular region of head; basal segment of rostrum extended nearly to base of head.....2
   Bucculae much longer, well extended beyond middle of gular region, often reaching base of head, not at all or very little longer than basal segment of rostrum.....5
2. Pronotum distinctly, longitudinally calloused on each side of middle line; veins of corium very faintly, if at all, spotted; color pale testaceous.....*basalis* Dallas
   Pronotum not distinctly longitudinally calloused; veins more or less heavily spotted with fuscous; color cinereous to fuscous..3
3. Costal margin of corium very slightly, if at all contracted at base; length 4.00 mm .....*adjunctor*, n. sp.
   Costal margin of corium contracted at base for a distance equal to about one-third the length of scutellum. Length 4.75 mm or more.....4
4. Length 5.50–7.00 mm; distribution, western North America, Mexico, Central America, and South America as far south as Argentina.....*californicus* Stål
   Length 4.75 mm; distribution, eastern North America, Dominican Republic, and Cuba; darker, with shorter antennae..... .....*californicus* subsp. *alabamensis* Baker
5. Bucculae high in front, slightly narrowing posteriorly, ending abruptly a little before (in *thymi*) or at base of head; scutellum and genital segment of male either entirely black or bicolored.....6
   Bucculae low, gradually fading out to end at a point before base of head; scutellum and genital segment of male usually entirely black.....10
6. Pronotum, viewed laterally, distinctly depressed before cicatrices; contracted basal part of costal margin devoid of fine hairs; membrane clear; basal part between apex of commissure and apices of coria distinctly shorter than apical part of membrane beyond apices of coria; color typically pale yellow testaceous, with inconspicuous pilosity; length 3.60–4.00 mm..... .....*tenellus*, n. sp.
   Pronotum, viewed laterally, not depressed anteriorly; contracted basal part of costal margin with fine hairs, often abraded; basal part of membrane between apex of commissure and apices of coria longer than apical part beyond apices of coria.....7
7. Large species, over 5 mm long; bucculae more strongly raised than in *angustatus*, their length is to the first segment of antenna as 28:20; pronotum wide, in relation to length it is as 70:45; color typically pale yellow testaceous with slight indications of maculae on the prominent veins; corium with very fine, short, appressed hairs; scutellum broadly pale on either side of middle; length 5.0–5.75. mm..... .....*insoletus*, n. sp.
   Size usually smaller; relative proportions of pronotum and scutellum otherwise; bucculae shorter and less raised; color cinereous with more conspicuous fuscous punctations and maculae.....8

8. Form more robust; width of head across eyes is to the greatest width of pronotum as 50:60. Head and pronotum appearing more flattened; antennae longer, 2.80 mm; corium darker, somewhat rusty cinereous; scutellum entirely black; length 4.80–5.00 mm..... *grandis* Baker

Form less robust; width of head across eyes is to the greatest width of pronotum as 45:52; head and pronotum less flattened; antennae shorter, 2.12 mm; scutellum either entirely black or bicolored; size averages smaller, 4.00–4.30 mm long.....9

9. Contracted part of costal margin of corium usually shorter in relation to length of scutellum, about as 15:23, and in relation to the expanded part of costal margin, as 15:75; first segment of rostrum a little shorter than bucculae; scutellum bicolored; length, 4.25–4.50 mm.... *angustatus* Baker

Contracted part of costal margin usually longer in relation to length of scutellum, about as 20:24 and in relation to the expanded part of costal margin, as 20:65; first segment of rostrum equal to or a little longer than bucculae; scutellum entirely shining black; length 3.60–4.00 mm..... ..... *thymi* (Wolff)

10. Pronotum short, nearly twice as wide as long (40:22) and subequal to length of head, costal margins of corium usually subparallel to each other, very little if at all expanded posteriorly; basal part of membrane from apex of commissure to apices of coria much shorter than apical part beyond apices of coria; smaller species 3.10–4.00 mm long..... *raphanus* Howard

Pronotum longer, much less than twice as wide as long (45:28) and usually a little longer than head; costal margins of corium not parallel to each other, parallel only at base, thence expanded posteriorly; basal part of membrane from apex of commissure to apices of coria more nearly equal to apical part beyond apices of coria; larger species 3.25–4.50 mm long.....11

11. Corium with erect hairs as well as dense coating of short appressed pubescence; length 3.80 mm..... *monticola* Distant

Corium with appressed pubescence, usually without erect hairs.....12

12. Corium and membrane more or less broadly infuscate; contracted basal part of corium rather densely pilose; length, male, 4.10 mm; female, 4.30–4.50 mm..... ..... *groenlandicus* (Zetterstedt)

Corium and membrane pale, with fuscous markings usually restricted to corial veins; contracted basal part of corium sparsely pilose; length 3.25–3.70 mm..... ..... *ericae* (Schilling)

ZOOLOGY.—*Notes on myiasis of the toad,* Bufo boreas boreas *Baird and Girard.*[1]

MAURICE T. JAMES, Colorado Agricultural Experiment Station, and T. PAUL MASLIN, Colorado A. & M. College.

On July 19, 1946, on a collecting expedition into Jackson County, Colo., the authors observed a case of myiasis of the mountain toad, *Bufo boreas boreas* Baird and Girard. The specimen was collected at an altitude of 9,500 feet in a small swampy meadow near the Columbine Camp Ground, Routt National Forest, U. S. Highway No. 40. When first sighted the toad lay extended on its side in the sun in a small semicleared area. Two large lesions were visible on the exposed flank. After the toad was captured, it was observed that these lesions were clean with smooth raised edges, each one measuring approximately 8 mm in diameter and containing a mass of small maggots. These were not counted, but it was estimated that there were approximately 30 in each lesion. The closely packed maggots were so oriented that their posterior extremities formed a granular pavementlike surface in the opening of the lesion. In addition to these two a third lesion was found on the dorsal surface of the tibia; though smaller, it included about one-half of the tibial gland. One or two maggots were extracted and examined. This disturbance caused the rest of the maggots to move about restlessly and to work deeper into the lesions. The maggots were not all of the same size; they varied from approximately 3 to 4 mm in length. The toad, active and apparently normal in every respect, was placed in a damp bag with three other toads of the same species and brought to Fort Collins, Colo.

On July 20 the bag was opened and the specimens examined. The infected toad was less active than the other three, and its lesions, as well as the maggots within them, were appreciably larger. The flank lesions could be moved freely with the skin over the undamaged body wall beneath; but the

[1] Colorado Agricultural Experiment Station Scientific Journal Series No. 241. Received April 24, 1947.

tibial lesion was seen to involve the underlying muscles.

On July 22 the specimens were again examined. The three uninfected toads appeared perfectly normal, but the infected one was dead. The maggots were much larger and showed definite indications of being negatively phototropic and positively thigmotropic. When left undisturbed they worked in the exposed lesions, but movements of the carcass caused them to retreat to the lower surfaces beneath the mass. The maggots now retained no definite orientation within the extensive lesions but worked independently under the adjacent areas in the cutaneous lymph sinuses or deeper into the abdominal cavity and muscles. As the maggots had still shown no indication of abandoning the carcass, it was transferred from the bag and placed on damp sand in a wide-mouthed jar. This was closed by taping the mouth of a second jar, partly filled with damp mud and sand, to its open end.

On July 23 it was noted that most of the maggots were still feeding and had grown appreciably. The toad was rapidly disintegrating through putrefaction and the action of the maggots. A few maggots had abandoned the carcass and the glass was marked with their tracks. There were also indications in the sand that some of the maggots were seeking retreats to pupate.

During the following three days the substance of the carcass rapidly disappeared and more and more maggots left the carcass for the sand; but a large number still remained in the putrefactive fluid in the sand around the now exposed bones.

Observations were discontinued until July 29. By this time a number of flies had emerged. Though the flies were dead and most of them in a disintegrated condition, a positive determination of *Bufolucilia elongata* (Shannon) was made. No more adults were recovered, but the determination was further confirmed through the examination of dead imagines within the puparia. A total of 76 puparia, either empty or containing dead imagines was obtained, in addition to ten larvae which had been extracted from the lesions on July 23.

On August 2 adults of *Muscina stabulans* (Fallen) began to appear, and on August 5 one adult of *Sarcophaga sarracenioides* Aldrich was obtained. These two species continued to emerge until August 10, by which time 70 individuals of the former and 9 of the latter species had been obtained. On August 19 the disintegrated substrate was torn apart and examined for pupal cases. During this process, five larvae of *Fannia canicularis* (Linnaeus) were obtained; two of these were reared for purposes of confirming the identifications.

All larvae extracted from the lesions on July 23 were *B. elongata*. This fact, together with the lapse of time before the emergence of the other species, indicates with fair certainty that this was the only species involved in the original parasitism. How the subsequent infestation occurred could not

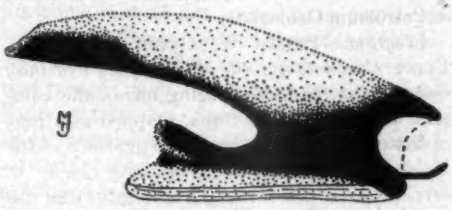

Fig. 1.—*Bufolucilia elongata* (*Shannon*)
Pharyngeal sclerite

be determined. The *Fannia* larvae were undoubtedly scavengers; two of them, indeed, were taken within the eaten-out puparia of *B. elongata*. The *Muscina* larvae, which are notoriously carnivorous in their last instar, may have been responsible for the destruction of the *B. elongata* adults.

The immature stages of *B. elongata* have not been described. The larval material at hand is too scant to permit a detailed description, but enough cephalopharyngeal skeletons were studied by the senior author to permit separation of the third instar, on this basis, from the only other known species of the genus, *B. sylvarum* (Meigen). The characters used are constant for the series studied, which includes cleared material obtained from the puparia, material in situ in the puparia, and a cleared specimen of a larva newly moulted into the third instar.

The larva of *B. sylvarum* was described

and illustrated by Knipling.[2] In *B. elongata* the oral hooks and hypostomal sclerite seem to show no significant differentiating characters. The pharyngeal sclerite (Fig. 1), however, is more robust; the dorsal cornu is more evenly convex and does not bend so strongly ventrad at its apex; and the ventral cornu at its apex does not approach the dorsal cornu so closely. Seemingly the most important differentiating character is the extent of sclerotization, the dorsal cornu being heavily sclerotized along its entire ventral margin, with a prominent expanded area at the apex.

[2] KNIPLING, EDWARD F. Iowa State College Journ. Sci. **10**: (3): 275–293. 1936.

PROCEEDINGS OF THE ACADEMY AND AFFILIATED SOCIETIES

GEOLOGICAL SOCIETY

634TH MEETING

The 634th meeting of the Society was held at the Cosmos Club, January 9, 1946, president W. H. BRADLEY presiding. A memorial to C. W. Gilmore was read by C. LEWIS GAZIN.

Informal communication.—HUGH D. MISER presented statistics on American Association of Petroleum Geologists.

Program.—PHILIP W. GUILD and D. E. FLINT: *Chromite deposits of Camagüey Province, Cuba.* The chromite-bearing ultramafic complex near Camagüey, Cuba, mapped as a part of the program of mineral investigations of the U. S. Geological Survey, consists chiefly of serpentinized peridotite (harzburgite) and dunite, with minor amounts of the feldspathic rocks: gabbro, troctolite, and anorthosite. This complex and the overlying Cretaceous tuffs and limestones were severaly deformed in an orogeny which culminated in extensive thrust faulting, probably in late middle Eocene time. The sedimentary rocks now occur in two synclinal arcs extending across the district parallel to the trace of the thrust. The feldspathic rocks of the complex flank the tuffs along the limbs of the syncline, indicating that they were concentrated in the upper part of the complex.

The chromite occurs as tabular or lenticular bodies of massive, coarse-grained, or occasionally fine-grained disseminated ore. Virtually all the known deposits are near the base of the feldspathic zone, but with an irregular lateral distribution which distinguishes them from the layered chromitites of the Bushveld-Stillwater type. Two possible modes of origin are discussed: (1) segregation of the deposits near the feldspar-peridotite boundary after emplacement of the magma through some process of gravity separation and magmatic flow; (2) differentiation of chromite at great depth before intrusion and transportation of the ore bodies as solid masses to their present position. The grouping into clusters, as though near feeders, and the massive texture and sharp contacts of many of the deposits suggest that the latter hypothesis is more probable.

A practical aspect of the study has been to suggest improvements in the pattern of future geophysical surveys.

JARVIS B. HADLEY: *Corundum deposits in Buck Creek peridotite, North Carolina.*

G. D. ROBINSON: *The 1945 eruption in Tulik Caldera, Umnak Island, Alaska.* The Alaska Peninsula and the Aleutian Islands comprise one of the more active but least known of the series of volcanic arcs which border the Pacific Ocean. The Aleutian volcanic arc includes about 80 large volcanic mountains, of which about 40 are known to have been active, some many times, since 1760, the earliest year of record. In 1945 a spectacular eruption on Umnak Island, third largest of the Aleutians, aroused much attention because it occurred only 9 miles from Fort Glenn, a large Army airbase. The writer observed the eruption at its explosive climax (June 6–June 10), but Lt. Ray E. Wilcox made most of the observations presented.

One of the world's largest calderas, formed by the decapitation of a peak once 7,000 to 10,000 feet high, dominates the northeastern part of Umnak Island. The caldera is 6½ to 7½ miles wide; its rim lies at altitudes of 2,900 to 3,900 feet; its walls drop abruptly 1,000 to 2,000 feet to the caldera floor. Disposed about the floor are nine large volcanic cones and many small ones.

A large cone near the southwestern edge of the caldera floor erupted violently in 1945. The eruption, preceded by a few mild earthquakes late in May, seems to have begun about June 4; on June 6 a dense ash cloud rising to 9,000

feet could be seen by fliers, but bad weather prevented detailed observation until June 10. On that date, steam rushed steadily from the crater at about 2,500 feet altitude, sending a white cloud to altitudes of nearly 5,000 feet. An explosion about every 10 seconds threw orange-hot bombs and lapilli, and black ash, as much as 1,500 feet above the vent. A stream of olivine basalt lava about 50 feet wide was flowing eastward from the southwest base of the cone at a rate of 30 to 40 feet per minute and was about 3,000 feet long; another, shorter ribbon of lava was flowing west into a shallow depression. Explosive activity diminished after June 10 and by July 22 the crater vent was discharging only a small steam condensation cloud; the main lava tongue had practically stopped flowing after reaching a length of 4 miles and a maximum width of 600 yards. A slight renewal of activity occurred in December 1945, when a little lava flowed from the northwest base of the cone and a large ash cloud rose above it for a few days.

This eruption, though far from being an outstanding volcanic event, has served to focus attention on the vulnerability of military establishments in the Aleutian Islands–Alaska Peninsula area to destructive volcanism, as well as to emphasize the scarcity of information about this great volcanic region. Largely in consequence of this eruption, long-needed funds have been made available to the Geological Survey for beginning a program of volcano investigations in Alaska.

(Author's note: The name Tulik caldera—for Mount Tulik, a prominent parasitic cone on the southeast flank of the decapitated volcano—seemed appropriate when the paper was given. It has since been learned that the native name for the decapitated volcano is Okmok and the caldera is therefore more properly called Okmok caldera.)

635TH MEETING

The 635th meeting of the Society was held at the Cosmos Club, January 23, 1946, Vice-president JOHN C. REED presiding.

Informal communication.—MARCUS I. GOLDMAN discussed an outfit for carrying acid in the field.

Program.—JOHN A. STRACZEK: *Manganese deposits in eastern Cuba.* Manganese deposits of eastern Cuba occur in a thick series of volcanic and sedimentary rocks of middle Eocene age which crop out in the Sierra Maestra and its northern foothills and in the southern foothills of the Sierra de Nipe. Water laid tuffs and agglomerates of andesitic character, interbedded with lenses of limestones, compose the bulk of the rocks of the formation although some flows and many small intrusives are present. These rocks are gently folded and are broken by many faults. Although manganese deposits occur throughout the section of pyroclastic and sedimentary rocks the bulk of the economically important deposits are localized in the upper part of the formation.

The manganese deposits may be grouped into three main divisions: bedded, nonbedded or irregular, and residual. The bedded deposits are economically and quantitatively most important. They are tabular bodies in tuff or limestone that do not appear to be associated with faults, The nonbedded deposits are irregular crosscutting bodies, commonly in limestone, that in some cases appear to be localized along faults or fractures. Residual deposits are surficial accumulations of manganese oxides formed by the weathering of primary irregular or bedded deposits.

Primary psilomelane-type manganese oxides form the chief manganese mineral of the deposits and pyrolusite, manganite, and braunite are common. Other manganese minerals include several varieties of manganese silicates. Gangue minerals include jasper, clay minerals of the montmorillonite group, calcite, zeolite, and celadonite(?).

Accumulated evidence supports the thesis that the bulk of the deposits are syngenetic and that structural control did not play an important part in their localization. General concordance of the deposits, the fact that intraformational conglomerates consisting of angular fragments of psilomelane-type manganese oxides cemented by limestone or tuff overlie many of the ore beds, and the fact that clastic dikes of foraminiferal limestone or of tuff crosscut many of the beds strongly supports a syngenetic origin. Yet these same deposits exhibit features which show that both limestone and tuff have been replaced by manganese oxides and locally transgress the bedding of the enclosing rocks. Warm hydrothermal solutions associated with centers of volcanic activity are believed to have risen along

conduits and to have deposited their loads at or near the tops of of pyroclastic and limy beds where the manganese oxides and associated elements were precipitated in the presence of sea water; some oxides were discharged directly on the sea floor but some replaced tuffs and limestones at or near the surface of deposition. These solutions altered tuffs to clay and other minerals and deposited jasper. The fact that many of the manganese deposits are associated with limestone is believed fortuitous; conditions favorable for the deposition of manganese and associated elements were also favorable for the deposition of limestone, both limestone and manganese deposits having been formed during temporary lulls between periods of more violent volcanic activity. The irregular deposits are believed to have been formed along faults and fractures formed during the long period of vulcanism and sedimentation.

As very little research has been done on the mineralogy of the deposits no theory can yet be advanced for the chemistry of deposition of the ores.

GEORGE O. GATES: *Recent exploration for oil in Naval petroleum reserve No. 4, Alaska.*

V. E. MCKELVEY and J. BALSLEY: *Distribution of black sands along part of the south Atlantic Coast as mapped from an airplane.* Black sand beach concentrates are more widely distributed along the beaches of North Carolina, South Carolina, and Georgia than has been recorded heretofore, as shown by a map prepared by airplane reconnaissance. The map shows also that the black sands diminish in abundance northward, that their distribution is in part related to the configuration of the shoreline, and that they are found only on beaches along the open sea.

636TH MEETING

The 636th meeting of the Society was held at the Cosmos Club, February 13, 1946, President W. H. BRADLEY, presiding.

Informal communications.—MICHAEL FLEISCHER called attention to the publication Chemical Abstracts, where references to literature on Chemical Geology may be found.

S. E. CLABAUGH discussed the Spiral Concentrator used by Humphreys Gold Operators on the black sands in Florida.

R. H. JAHNS discussed the program of muscovite testing during 1945.

Program.—W. T. PECORA, M. R. KLEPPER, and D. M. LARRABEE: *Mica-bearing pegmatites in Minas Gerais, Brazil.* In the period 1900–45 about 8,500 metric tons of processed muscovite mica were exported from Brazil, and of this amount about 60 percent has been exported since 1940. The total mine production since 1900 is estimated to have been about 90,000 tons of crude mica. Prior to 1943, almost all the production was derived by hand mining. In the period 1943–45, some 30 mines employed earth-moving equipment in open pit operations and some 20 used air-compressor for underground rock drilling. As a result of the stimulated war production a number of mines have seriously depleted indicated reserves but others have developed even greater reserves.

More than 85 percent of the mica mines and prospects are located in the eastern part of the state of Minas Gerais and about 95 percent of Brazilian production has come from this state. Other mica-producing states are Rio de Janeiro, São Paulo, Espirito Santo, Bahia, and Goaiz.

In size, the mica-bearing pegmatites range up to hundreds of meters in length and up to tens of meters in thickness. In form they are tabular, lenticular, irregular, and ramiform. They occur in a wide variety of igneous and metamorphic rocks that are assigned by Brazilian geologists to ages ranging from the Archaean to upper Algonkian. Pegmatites in quartzite, gneiss and igneous rocks are commonly discordant, well-formed, tabular or lenticular masses; whereas those in mica schist are concordant, quasiconcordant, and discordant and include a wide variety of forms.

An internal zoning based on mineral association and texture has been recognized for a great number of mica-bearing pegmatites The zoning is simple or multiple, symmetric or asymmetric. The bulk of the Brazilian mica production has come from zoned pegmatites. In general, a more complex mineral assemblage occurs in the pegmatites of northeastern Minas Gerais.

Local exceptional concentrations of muscovite mica, related to external or internal structural features, are termed mica shoots. A single pegmatite may have more than one mica shoot. The percentage of mine-crude mica ranges up to 20 percent in the shoots, and the quantity of mine-crude ranges up to a few thousand tons.

Beryl, tantalo-columbite, gem stones, and kaolin have been recovered from a number of pegmatites containing mica. Lithia minerals occur in several pegmatites but have received no commercial attention. The indicated reserves of mica and associated industrial minerals in northeastern Minas Gerais are greater than those in the more accessible southeastern part of the state. The mica industry as a whole and many mica mines in particular are more firmly established for postwar production than they were in pre-war years.

G. EDWARD LEWIS: *Tertiary geology of northeastern Wind River Basin.* Recent work by the United States Geological Survey has amplified considerably our knowledge of the geology of the northeastern Wind River Basin. A lithologic unit which contains a fossil vertebrate fauna intermediate between those of the Uinta and Chadron formations has been recognized in the area for the first time, and is correlated with the Duchesne River formation.

FRANK A. SWENSON: *Geologic work for military forces on Iwo Jima, Okinawa, and in Korea.* As a member of the Engineering Terrain Intelligence Team of the U. S. Geological Survey the writer helped make detailed plans for the Iwo Jima and Okinawa operations and took part in them as a geological consultant.

One month, from March 10 to April 10, was spent on Iwo Jima. This island consists of two volcanic cones, the younger, Mount Suribachi is at the southern end, and the older makes up the northern bulge of the island. Between them there is a thick deposit of loose black volcanic cinder derived from Mount Suribachi. No surface water or springs are present. Japanese obtained water from shallow wells dug in beach area, by distillation of sea water, by storage of runoff from airfields and from small prepared catchments, and by condensation of steam from numerous fumeroles. American forces obtained fresh water by drilling wells to sea level in volcanic cinder plain between volcanic cones. Fresh-water lens stands from 7 to 15 feet above sea level in wells drilled. Wells have high specific capacities and it is estimated that at least one million gallons per day may be developed. Water ranges in temperature from 100° to 180° F. and is somewhat mineralized but is entirely potable. Rock for surfacing of airfields was obtained by crushing andesite cobbles from a raised beach. Boulders were derived mainly from wave erosion of the andesite plug underlying Mount Suribachi.

After Iwo Jima, five months were spent on Okinawa obtaining water supplies, locating soft coral pits and hard limestone quarries and giving advice on engineering geology problems of airfield drainage and construction. The chief water-bearing bed was the coralline limestone. Numerous springs, some of large size, issued from the base of this limestone. Wells drilled in the limestone obtained good supplies in most cases. In places it was necessary to construct infiltration galleries to skim fresh water from beach deposits. Numerous soft coral deposits were located and pits were opened in them to provide the great quantities of coral needed for airfield and road construction. Hard limestone quarries were opened to furnish crushed rock for airfield and road surfacing.

After VJ day John Wiese, S. Neuschel, and the writer accompanied the XIV Army Corps to Korea. Work there consisted mainly of visiting and investigating all mining properties in the American occupied zone. Anthracite, molybdenum, and tungsten mines were most prominent, but mines producing gold, silver, zinc, copper, lead, cobalt, nickel and corundum were visited.

637TH MEETING

The 637th meeting of the Society was held at the Cosmos Club, February 27, 1946, President W. H. BRADLEY presiding.

Informal communications.—S. E. CLABAUGH exhibited the Mineral Resources maps of the Missouri River Basin, recently released.

L. G. HENBEST discussed Permian chert cobbles from the gravel beds of Eocene age in the Ozarks.

Program.—ESTHER W. CLAFFY: *Spectrochemical analysis of rocks and minerals.* Spectrochemical methods used in the U. S. Geological Survey laboratory are adjusted to the problems of rock and mineral analysis. About 70 chemical elements are determined—major constituents qualitatively, minor constituents quantitatively. The finely powdered sample, weighing 20 mg or less is burned in a carbon anode, using the direct current arc. Because of the small size of the sample and the inherent sensitivity of the method sampling

errors must be minimized. Where traces of Cu, Sn, and Pb are in question soldered copper sieves cannot be employed during sample preparation. Specially purified electrodes are used where contamination from Cu, V, B, Ag, Mg, or Pb is undesirable.

A medium-sized quartz spectrograph records the entire spectral range 2200Å–8600Å on a single plate. For greater dispersion a large Littrow quartz spectrograph or a grating spectrograph is used. The spectrograms are complicated by background lines from carbon and from silicon monoxide and cyanogen bands. Sensitive lines of 45 of the 70 determinable elements are located in the ultraviolet region comparatively free from such interferences. For ordinary work results are accurate to one significant figure. Two significant figures can be attained for special problems.

Comparison standards are generally prepared by incorporating the desired element, preferably as the natural mineral, into a synthetic rocklike mixture of feldspar, quartz, and iron oxide. Intensity of spectral lines of an element is influenced by its state of chemical combination and the nature of the matrix. For accurate results standards must closely approximate the "unknown" sample in chemical and mineralogical composition. Tin is peculiarly sensitive, a silicate base causing an appreciable and nonuniform deviation in line intensity as compared with a ludwigite mineral base. Sensitivity of detection varies with the elements. Alkaline earths, Li, Na, Ni, Cu, Ag, and Ti, can be detected at 0.001 percent. Sb, As, and many rare earths can not now be detected below 0.01 percent. Use of special techniques sometimes extends the lower limits. Among the limiting factors may be inherently weak spectral lines, extreme volatility, extreme refractoriness, and interference by lines of other elements present.

ROBERT E. WALLACE: *Notes on permafrost investigations in Alaska.* Permafrost is perennially frozen ground in which ice or freezing temperatures exist the year around. Approximately one-fifth of the land surface of the world is underlain by permafrost. Some of the economic aspects of permafrost include its effect on construction and maintenance of roads, buildings, water supply and disposal facilities, airfields, and in the development of agriculture.

Certain basic aspects of the problem can best be attacked by men trained in geology because permafrost is essentially a geologic phenomenon. Some of these geologic problems are: the relationship and effect of permafrost on ground and surface water, relationship of soil types to the nature and distribution of permafrost, and the effect of permafrost on physiography. For example, one principal problem in choosing the site for the installation of a road, airfield or building is to determine which areas of ground will be subject to slumping upon thawing of permafrost and which areas will remain stable. As might be expected, this unstable type of ground has its manifestations in the physiography of the area. One outstanding physiographic expression of this condition is the "cave-in lake" or "thermokarst lake." A study was made of cave-in lakes in Alaska in connection with the Geological Survey's permafrost project which is being conducted in cooperation with the office of Chief of Engineers. This study revealed some of the characteristics of cave-in lakes, making it possible in many cases to identify them with considerable certainty in aerial photographs as well as by ground examination and thus to be forewarned of "dangerous" permafrost ground.

In the lower parts of the Nabesna and Chisana River Valleys stages of a cave-in lake cycle were observed. The pattern of an incipient cave-in lake is typically circular. As thawing proceeds and the banks retreat away from the centers of the lakes, individual lakes are joined to other lakes and aggregates of lakes result. Eventually groups of lakes are integrated and drainage takes place through them. Many of the lakes observed in the Nabesna and Chisana flood plains were at approximately river level. Once a group of lakes in such a position become joined to the river they are alternately flooded and drained as the river level rises and falls. This flooding and draining causes natural levees to be formed along the drainage channels which cross the lake basins. In time the natural levees separate the lakes basins into parts, and in the old age stages of the cycle constitute the principal land areas, the rest being principally areas which have caved and formed lake basins.

DAVID A. ANDREWS: *Significance of stylolites in sandstone.* Diamond drill cores of formations of Pennsylvanian age in western Maryland and northeastern Alabama contain stylolites in the sandstones of all the formations encountered. The stylolites are sparse in

some sandstones but are rather abundant in the quartzitic sandstones. They have the characteristic jagged or hackled form of stylolites in limestone and they have amplitudes of up to 2 inches. As they show slickensides, they were formed after consolidation of the sandstone. Thin sections indicate solution of nearly all quartz grains in contact with the stylolites ranging from slight to almost complete obliteration of individual grains. Residual clay and carbonaceous materials are present in most places along the stylolite seams.

Though references in geologic literature to stylolites in sandstone are rare, their abundance in these two localities, 600 miles apart along the eastern margin of the Appalachian Plateau Province, leads one to question whether they are not more abundant than heretofore observed or recognized.

The Appalachian Plateau Province is not a mineralized belt, and there is no evidence of hydrothermal action in these two areas unless the presence of dickite associated with the stylolites in Maryland is regarded as indicative of a temperature of 100° C. for the solutions that deposited the dickite and interstitial quartz. The maximum cover in western Maryland probably did not exceed 3,000 feet. There probably was an increase in thermal gradient during folding of the Appalachian Mountains.

These data lead to significant but unsolved questions: (1) May the solution of quartz have been more extensive than is indicated by the stylolites? (2) Was this fairly extensive solution of quartz accomplished by normal ground waters?

638TH MEETING

The 638th meeting of the Society was held at the Cosmos Club, March 13, 1946, President W. H. BRADLEY presiding.

New business.— W. G. SCHLECHT offered a resolution urging the adoption of the original McMahon bill for control of atomic energy.

Informal communication.—H. SHELTON exhibited a new type of topographic map with which the Geological Survey is experimenting.

Program.— LLOYD G. HENBEST: *The Morrow group of northwest Arkansas.* The type sections of the Morrow group and its subdivisions are located in Washington County, Ark. The Morrow group occupies a key position in the classification of the Lower Pennsylvanian. Though the Morrow group has been the subject of considerable study, certain misconceptions on its stratigraphy are being perpetuated. The Hale formation, instead of being an irregular complex of crossbedded sediments, is divisible into two units that are rather widely distributed and have distinctive features. The lower unit is locally misidentified as belonging to the Fayetteville shale, and part of the upper unit is very generally misidentified as the Brentwood limestone member of the Bloyd shale. In at least one instance the upper unit has been confused with the Pitkin limestone, Mississippian. Of the outstanding residual Mississippian elements in the Morrow fauna *Pentremites* is obviously indigenous and *Archimedes* evidently redeposited from the Pitkin limestone. *Millerella*, which is widely characteristic of marine sediments of Morrow age, is present also in the Pitkin fauna of late Mississippian age. This is the earliest stratigraphic record so far authenticated for a member of the family Fusulinidae.

K. J. MURATA and ROBERT L. SMITH: *Red fluorescing halite from California and Idaho.* The bright red fluorescence of halite from California dry lake deposits and from a salt spring in Idaho is due to coactivation by minute amounts of manganese and lead. Neither manganese nor lead alone activates the red fluorescence. Chemical, spectrographic, and synthetic experiments, which identify manganese and lead as coactivators and throw light on the mode of coprecipitation of these elements by growing halite crystals, are described. The marked preferential coprecipitation of lead by growing halite crystals results in zoning of fluorescence in crystals and restriction of fluorescence to the first crops of crystals, when the supply of lead is limited.

JOHN G. CADY: *Application of soil science in geology.*

639TH MEETING

The 639th meeting of the Society was held at the Cosmos Club, March 27, 1946, President W. H. BRADLEY presiding.

Informal communication.—GERALD FITZGERALD discussed the Geological Survey's experiments with relief models.

Program.—O. E. MEINZER: *General principles of artificial ground-water recharge.* Paper published in Economic Geology **41**: 191–201. 1946.

HERBERT E. HAWKES, JR.: *Magnetic exploration for Adirondack iron ore.* In June 1945, the Geological Survey completed a

magnetic reconnaissance of an area of approximately 3,170 square miles in the Adirondacks of northern New York in an effort to locate hitherto unknown deposits of magnetic iron ore. The reconnaissance work was done with the Magnetic Airborne Detector originally developed for antisubmarine detection by the Armed Services, and adapted for geophysical work by the Geological Survey.

In general, nontitaniferous magnetite is found where the younger granite intrudes metasedimentary rocks of the Grenville series, and such areas were selected for reconnaissance. Aerial traverse lines were spaced at quarter-mile intervals, and lines were flown at an average elevation above the ground surface of 1,000 feet. Following the reconnaissance work, dip-needle surveys were run on about 50 of the more promising magnetic anomalies. Of these, 10 proved to be relatively strong anomalies, whereas the remaining 40 turned out to be broad zones of low magnetic intensity of little commercial interest.

The country is heavily glaciated, and outcrops in general are scarce. In the area surveyed, it is reasonable to assume that all the important magnetite deposits, whether drift covered or not, with a strike length of more than 1,000 feet have been indicated by the airborne magnetometer. From an analysis of these data, it is concluded that at least in St. Lawrence County the number and aggregate extent of magnetite deposits obscured by glacial cover is at least as great as that of the deposits which were found by their outcroppings.

RALPH L. MILLER: *Structure of the Cumberland overthrust block in southwest Virginia.* The Cumberland overthrust block covers an area, approximately 125 miles long and 25 miles wide, in southwest Virginia and adjoining Kentucky and Tennessee. The overthrust plane, along which the block has moved to the northwest, has been named the Pine Mountain overthrust from its outcrop along the base of Pine Mountain in Kentucky. Tear faults at the northeast and southwest ends of the Cumberland block separate it from the relatively undeformed sediments of the Appalachian Plateau. To the southeast the block is cut off from the folded and faulted rocks of the Appalachian Valley by two thrust faults, which dip to the southeast at moderate angles. Within the overthrust block are two broad gentle folds, the Middlesboro syncline, which occupies the northwest half of the block, and the Powell Valley anticline occupying the southeast half. Erosion along the crest of the Powell Valley anticline in Lee County, Va. has exposed the rocks beneath the Pine Mountain overthrust in six fensters, which are for the most part confined to valley bottoms. Excellent exposures in the fenster region, and the drilling for oil both inside and outside the fensters has made it possible to work out the history and phenomena of the overthrusting in great detail.

In the fenster area the rocks of the underlying stationary block dip to the northwest in the southern and western fensters but are nearly flat-lying in the northeastern fensters. The formations in this block that are exposed in the fensters range in age from Lower Ordovician to Upper Silurian, and they are enclosed and overlain by limestones and dolomites of Upper Cambrian age.

In much of the fenster region, the Pine Mountain overthrust fault is dual, with slices of much deformed and brecciated rock lying between the two fault planes. Two major slices have been mapped and their limits are accurately known, except where they are entirely concealed by the Cumberland overthrust block. In addition numerous small slivers which have been torn loose from the top of the stationary block, have been dragged along the fault plane and are now exposed around the rims of the fensters. The slivers have moved forward distances varying from a few tenths of a mile up to 2 miles. The total forward movement of the overthrust block in this area is calculated to be 5.8 miles.

The Pine Mountain fault plane developed numerous irregularities during the period of overthrusting as shown by the fact that it now has prominent changes of attitude that are not reflected in the overlying rocks. The arching of the Powell Valley anticline began before overthrusting was completed.

640TH MEETING

The 640th meeting of the Society was held at the Cosmos Club, April 10, 1946, President W. H. BRADLEY presiding.

Informal communication.—RUTH SCHMIDT discussed the present status of the Atomic Energy Committee.

LEONA BOARDMAN announced the compilation of geologic mapping in the United States.

T. W. VAUGHAN called attention to a report

on 8,000 gravity stations in Burma published in a recent volume of the Proceedings of the Geologic Society of London.

Program.—G. A. COOPER: *The role of fossils in stratigraphy.*

ERNST CLOOS: *A preliminary report on the geology of Montgomery County, Maryland, and the District of Columbia.*

641ST MEETING

The 641st meeting of the Society was held at the Cosmos Club, April 24, 1946, Vice-President J. C. REED presiding.

Program.—T. S. LOVERING: *Some chemical aspects of hydrothermal alteration in the Tintic district, Utah.*

THOMAS P. THAYER: *Late stages of erosion cycle in tropical rain forests.*

642D MEETING

The 642d meeting of the Society was held at the Cosmos Club, October 23, 1946, President W. H. BRADLEY presiding.

Program.—JOSHUA I. TRACEY, Jr.: *Reefs and Islands of the Marshall group.*

ROGER REVELLE: *Some scientific dividends of the atom bomb tests.* A movie of the Bikini tests was shown.

643D MEETING

The 643d meeting of the Society was held at the Cosmos Club November 13, 1946, President W. H. BRADLEY presiding.

Informal communication.—N. H. DARTON discussed the basis of map projections.

Program.—CLYDE P. ROSS: *Structure of the front of the Bitterroot Range, Montana.* Concepts as to the structure of that portion of the east front of the Bitterroot Range that bounds the Bitterroot Valley were among the byproducts of field work in the summer of 1946 done in connection with the compilation of the western half of a proposed new geologic map of Montana. Lindgren postulated that the gneiss of this mountain front resulted from a normal faulting of low dip, movement on which began soon after the Idaho batholith was emplaced. He emphasized his opinion that "the rocks along it bear evidence of molecular and molar movement." He also presented evidence of steeper normal faulting some of which took place as recently as 1898, the year before he did his field work. Langton, whose field work began in 1932, agreed that the gneiss resulted from normal faulting and, in addition, postulated a thrust fault of easterly dip earlier than the intrusion of the batholith. He supposed this fault to be contemporaneous with the steep thrusts that Clapp inferred to bound the linear ranges of northwestern Montana. Both Lindgren's concepts and those of Langton are difficult to reconcile with the idea now held by several geologists that the Idaho batholith made way for itself, at least in part, by exerting pressure on its walls.

The writer's concept is that the gneissic border zone along the front of the Bitterroot Range in this area is a product of impregnation and replacement of sedimentary rocks of the Belt series (pre-Cambrian) by igneous material from the same source as the Idaho batholith. The gneiss is part of an incomplete border zone composed of metamorphosed sedimentary rocks and intrusive bodies that partially surround the Idaho batholith. Normal faults of undetermined magnitude probably exist along the mountain front but are independent of the gneissic border zone and of the roughly triangular mountain spur ends carved from the gneiss by differential erosion.

OLAF HOLTEDAHL: *The west Scandinavian (Caledonian) Mountain Range.*

HERBERT E. HAWKES, Jr.: *The Geological Survey's geochemical prospecting unit.* The Geological Survey has undertaken a program of research on new methods of prospecting for mineral deposits, based on studies of the geochemical dispersal of minor elements derived by the leaching of buried mineral deposits. Particular emphasis is being placed on the content of zinc, copper, and lead in soil, vegetation, and natural water, and its relation to known or suspected bodies of ore.

Considerable data on the distribution of these elements in surface materials have already been collected by agricultural scientists in their studies of inorganic plant poisons and fertilizers. Their work gives the geologist a broad background of analytical techniques and preliminary geochemical information which can be applied with little modification or reinterpretation to prospecting problems.

Several geochemical field studies are currently in progress, and preliminary results are believed to be sufficiently encouraging to warrant further and more intensive study. The ultimate goal of the Geological Survey's program is the development of a routine method

by which a relatively untrained field party will be able to prospect for hidden mineral deposits by tracing the distribution of minor elements in surface materials.

644TH MEETING

The 644th meeting of the Society was held at the Cosmos Club, November 27, 1946, President W. H. BRADLEY presiding.

Informal communication.—FERNAND ALBERT J. BLONDEL, Chief Geologist of French Territories, discussed recent developments in North Africa.

Program.—WENDELL P. WOODRING: *Marine terrace deposits of mountainous coasts.* The deposits on emerged marine terraces of mountainous coasts are of two classes: marine deposits, generally thin, resting directly on the terrace platform; and nonmarine deposits, invariably thicker, overlying the marine deposits, or in their absence, lying on the terrace platform. The nonmarine deposits, which accumulated after emergence and were derived from the cliff backing a terrace and the highland farther inland, are designated the nonmarine terrace cover. A thick nonmarine cover may extend seaward over the next lower terrace, or still lower terraces, with a smoothly graded profile, completely concealing the sea cliff between successive terraces. A nonmarine cover of that character is designated a multiple cover, as contrasted with a single cover.

Interpretations of the origin of chromite-bearing sands, "associated with" marine terraces along the coast of southern Oregon, fail to account for nonmarine covers, and one interpretation fails also to account for marine deposits.

WATSON H. MONROE: *Recent changes in the stratigraphy of the Gulf Coast Cretaceous.*

WILLIAM D. JOHNSTON, Jr.: *The Geological Survey in Latin America.* Geologic studies in Latin America were begun by the U. S. Geological Survey in 1940, under the auspices of the Interdepartmental Committee on Scientific and Cultural Cooperation of the Department of State. Since 1940, about 40 geologists of the Geological Survey have worked on that program in various countries of Central and South America and in Mexico. Results of some of these investigations have been published, in English, in Bulletins 935 and 946 of the Geological Survey entitled "Investigations in the American Republics"; in Spanish in the Boletins of the Comité Directivo para la Investigación de los Recursos Minerales de Mexico; and in Portuguese, in the Boletins and Avulsos of the Divisão de Fomento da Produção Mineral of the Departamento Nacional da Produção Mineral of Brazil.

During the war years, the Latin American program was focused on the immediate production of strategic minerals. With peace has come a reorientation of the program wherein the focus has been shifted to other mineral deposits, such as iron, lead, zinc, and copper, in which the United States faces serious depletion in its own reserves within the next two decades. This shift in emphasis has been accomplished after frank discussion with responsible officials in various Latin American countries of our respective interests as buyers and sellers of mineral raw materials.

Although approximately 90 percent of the annual budget of the geological program in Latin America is spent on problems in economic geology, some purely scientific studies are maintained. As examples of the latter type might be mentioned the maintenance of an observer at the volcano Parícutin in Mexico and stratigraphic studies in southern Brazil.

645TH MEETING

The 645th meeting of the Society was held at the Cosmos Club, December 11, 1946, Vice-president JOHN C. REED presiding.

Program.—Presidential address by WILMOT H. BRADLEY: *Limnology and the Eocene lakes of the Rocky Mountain region.*

54TH ANNUAL MEETING

The 54th annual meeting was held immediately following the 645th regular meeting. The reports of the Secretaries, Treasurer, and Auditing Committee were read and approved. Officers for the year 1947 were then elected:

President: WENDELL P. WOODRING
Vice-Presidents: ERNST CLOOS, WILLIAM D. JOHNSTON, Jr.
Secretary: GEORGE T. FAUST (for two years).
Treasurer: M. K. CARRON
Council: PAUL AVERITT, GORDON DAVIS, ROBERT E. FELLOWS, MARJORIE HOOKER, WILLIAM G. SCHLECHT.

The Society nominated W. W. RUBEY to be a Vice-President of the Washington Academy of Sciences for the year 1947.